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UNIVERSITY OF CALIFORNIA

# Apricot Culture

## IN CALIFORNIA

C. O. HESSE

CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service

CIRCULAR 412

## California apricots . . .

make up 85 per cent of those grown in the U. S., and from 35 to 40 per cent of the world's total supply. Most of the plantings are confined to the central coast and Central Valley.

The biggest percentage of California apricots are dried; canning sales come next, followed by fresh sales and sales to freezers, in that order. However, the freezer market seems to be on the decline and the canning market seems to be overhauling the dried fruit market, in recent years.

## Apricot trees need . . .

a climate that provides cold winters, sufficient early heat to mature the fruit before extreme summer temperatures; little or no fog; deep, fertile, well-drained soil; adequate winter rainfall, or available irrigation water where winter rains are light.

They require a certain amount of "pampering" and are subject to a number of pests and diseases.

## This circular . . .

describes in detail the methods that have been used successfully to raise apricots in California.

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# Apricot Culture IN CALIFORNIA

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## SECTION I - Apricot raising as a business

**The prospective grower is urged to consider a number of factors about apricots . . namely:**

### 1. What has happened in the past

The apricot, *Prunus armeniaca*, L. is related botanically to the other stone fruits. Its original home is now thought to be in the Eurasian area near the Caucasus Mountains, and eastward into China. Historically, the apricot apparently first moved into Greece and the Mediterranean area by way of the old trade routes; probably through Armenia, hence the name *P. armeniaca*. From the countries of the Mediterranean basin France and England secured the strains of apricot from which most of this country's present commercial varieties have developed.

From the western European nations, the apricot was scattered over the world in the period of discovery and colonization; most of the varieties developed in that era were brought to America and were tested extensively in the eastern seaboard colonies. With the development of the Agricultural Experiment Stations during the period from 1850 to 1900 the apricot was widely tested throughout the United States. The early blooming habit of the apricot precluded commercial development in the east and central states. If grown far enough south to escape serious spring frost damage, the chilling requirement was not met. Therefore, the apricot was found to be poorly adapted to most fruit-growing regions of the country with a few exceptions, notably in California.

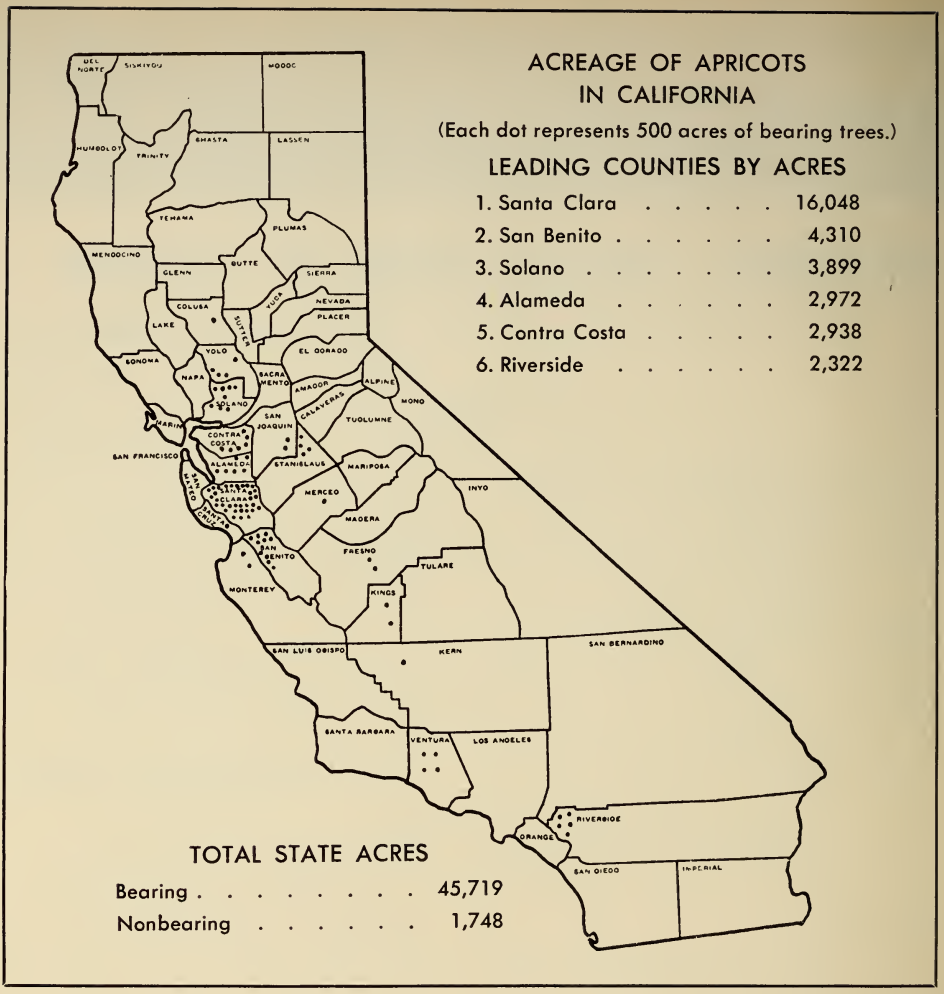
IN THIS SECTION



### 2. Producing areas and varieties

Outside the United States apricots are produced in quantity in Europe, Australia, Africa, and in Argentina and Chile in South America. Apricots from these areas may compete with California canned and dried fruit on the international markets, and therefore the world production is important to California growers. California is the most important producing region in the world, normally growing between 35 and 40 per cent of the world's apricot supply.

California produces about 85 per cent of the apricots grown within the United States. Apricots are also grown on a commercial scale in the states of Washington, Idaho, Utah and Colorado, and commercially unimportant production is scattered through several states of the southwest, midwest and east.




Most of the fruit grown outside California enters the fresh fruit markets, although some is canned. As the season for apricots is considerably later in these other areas than it is in all but the latest sections of California, there is little competition on the fresh markets under present commercial shipping schedules.

The commercial apricot industry of California developed rapidly after the 1850's. Originally the industry was based largely on seedlings, but the value of named varieties introduced from the eastern seaboard and Europe, together with certain of the best local seedlings, soon placed the industry on a variety basis. In the early years, the apricot was grown throughout the state, some areas favoring one group of varieties over those grown in other areas. By the turn of the century, however, the list of recommended varieties was reduced, and after 1920 the Royal, Blenheim and Tilton varieties emerged as the best.

With the reduction in number of acceptable varieties there was also sharper definition of the areas devoted to the culture of apricots. Certain locations proved to be much more favorable for annual production of profitable crops with the least difficulty from serious pests, diseases, or unfavorable climatic and cul-

tural conditions. The accompanying map shows that the present large acreages of apricots in California are largely confined to the central coast, the Central Valley, and certain sections of southern California. However, small plantings or dooryard trees are found in many places where the commercial production of apricots is not followed.

The restriction of the commercial apricot-producing areas of the state is related to the climatic requirements of the apricot, as discussed on page 7. Since these requirements are rather limiting if quality fruit is to be grown, the areas to which the apricot has proven commercially satisfactory are fairly well defined, and often of small extent. The scattered plantings through the Central Valleys are often in marginal climatic locations, and there is very little new planting. The most suitable areas seem to be the coastal valleys, especially those south of San Francisco Bay, including the counties of Santa Clara, Contra Costa, San Benito, Solano, and Monterey, and adjacent counties in the Central Valley.

## 3. Trends in acreage and production

The trend in bearing, nonbearing, and total acreage in the state for the past 30 years is shown in table 1 by decades, and in detail for the years 1939 through 1950.

The decade from 1919 to 1928 was characterized by steadily increasing bearing acreage from 42,900 in 1919 to the highest acreage for the entire thirty years of 83,000 acres in 1928. (Annual values not shown in the table for the decades 1919–1928 and 1929–1938.) During this period the nonbearing acreage was at a high level, reaching a peak of 30,449 acres in 1924, and then beginning to drop rapidly, with an average for the decade

**Table 1. California Apricot Acreage Figures**

| Decades | Average bearing acreage | Average nonbearing acreage | Average total acreage |
|---|---|---|---|
| 1919–1928 | 65,239* | 22,410 | 87,649 |
| 1929–1938 | 78,459 | 6,661 | 85,120 |
| 1939–1948 | 67,671 | 3,336 | 71,006 |
| **Annually 1939–1950** | **Bearing acres** | **Nonbearing acres** | **Total acres** |
| 1939 | 72,694 | 5,436 | 78,130 |
| 1940 | 70,464 | 5,012 | 75,476 |
| 1941 | 68,719 | 4,185 | 72,904 |
| 1942 | 67,293 | 3,852 | 71,145 |
| 1943 | 67,251 | 3,459 | 70,710 |
| 1944 | 66,899 | 3,111 | 70,010 |
| 1945 | 66,952 | 2,554 | 69,506 |
| 1946 | 67,346 | 2,228 | 69,574 |
| 1947 | 66,255† | 1,893 | 68,148 |
| 1948 | 62,841 | 1,630 | 64,471 |
| 1949 | 52,969 | 1,824 | 54,793 |
| 1950 | 45,719 | 1,748 | 47,467 |

* All acreage estimates for 1919 to 1946 from California Crop Reporting Service, as reviewed and revised by Counties and State in April, 1948. (Unpublished)

† Acreage estimates for 1947 through 1950 from: Acreage Estimates, California Fruit and Nut Crops, 1948, 1949, 1950, and 1951 (respectively), Crop Reporting Service.

of 22,410 acres. This combination of relatively high bearing acreage and very high nonbearing acreage resulted in the highest average *total* apricot acreage in the decade 1919–1928.

The average bearing acreage for the decade 1929 to 1938 was higher than for the previous decade, although the total acreage was gradually declining. This merely reflected the peak bearing and nonbearing acreages of previous years. During this period the nonbearing acreage dropped sharply, from 10,708 acres in 1929, with an average nonbearing acreage of 6,661 acres for the decade. The total acreage dropped in a like manner, from over 93,000 acres in 1929 to less than 80,000 acres by the end of the decade, an average of about 2,500 acres less than the previous decade.

The average acreage for the twelve years beginning in 1939 can be followed in detail in the table. The large average losses in acreage for the decade 1939–1948 are shown to be due to a steady decrease in the apricot acreage of the state—both bearing and nonbearing. A survey of the acreage figures during the entire yeriod indicates that between 5,000 and 6,000 nonbearing acres are necessary to maintain the bearing apricot acreage at the approximate level of the 1929 to 1938 decade. The deficiency in planting in recent years is further emphasized by the fact that the total acreage has decreased more than 30,500 acres in the past 12 years. This tremendous reduction in apricot acreage has been due to pulling of large acreages of submarginal orchard in Central Valley and southern California locations due to poor returns for dried apricots, and to losses in expanding suburban and industrial areas, notably in the Santa Clara Valley. The apricot is a long-lived tree and relatively few orchards are pulled because of age alone.

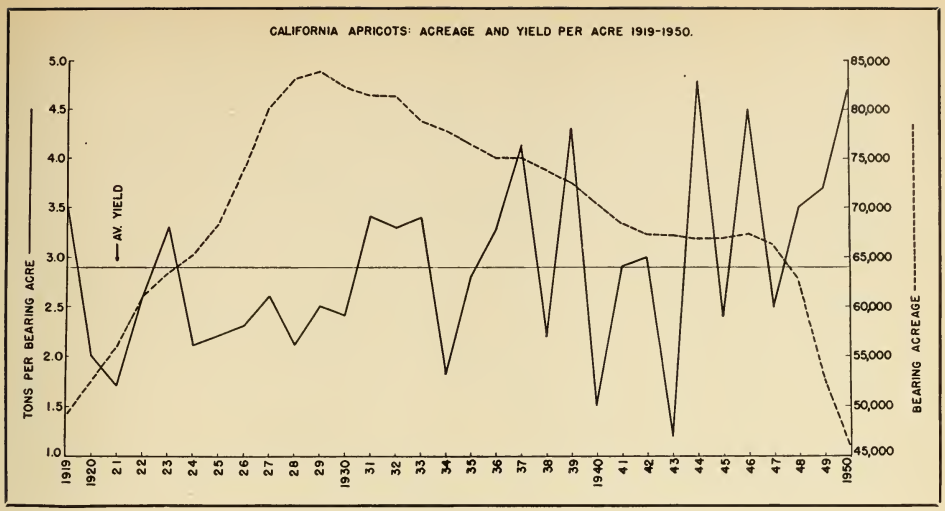
It seems likely that the present apricot acreage will be maintained, and perhaps show a slight gain, after the recent destruction of orchards. Remaining orchards are in proven districts, and the supply of apricots seems to be reasonably well adjusted to demand.

**Yield.** The apricot is subject to rather violent fluctuations in production from year to year, as shown in the accompanying graph. In years of good crops, average yield has been as high as 4.8 tons per acre (1944), and conversely it has sunk to a low of 1.2 tons per acre in years of poor crops (1943).

The violent seasonal fluctuations in the apricot crop have concealed a slow but consistent increase in the average tonnage per acre. During the decade 1919–1928 average production per acre was approximately 2.4 tons. During the next decade production averaged 2.9 tons per acre, and from 1939 through 1948 3.1 tons per acre. For the past ten years, average production has been 3.3 tons per acre and during the past 5 years an unprecedented 3.8 tons per acre. The increase in tonnage per acre is undoubtedly due to the gradual restriction of production to the best-adapted areas and to improved cultural practices, especially in the control of diseases.

## 4. Market outlets for apricots

Three primary outlets are available for disposition of the fruit grown. These are: fresh market or dessert use, drying, and canning. In more recent years the development of the freezing industry has added a fourth outlet. The graph on page 5 indicates the trend in the relative proportion of the total crop entering each of these outlets (except frozen) for the past 40 years. As is evident, the bulk of the apricot production of California enters the dried fruit market, although in recent years the proportion dried has dropped rather sharply. Because of the unsettled conditions prevailing during the war years, it is not possible to say whether or not this is a permanent trend. However, it is generally felt that the drying phase of the apricot industry will not reach its former importance because of



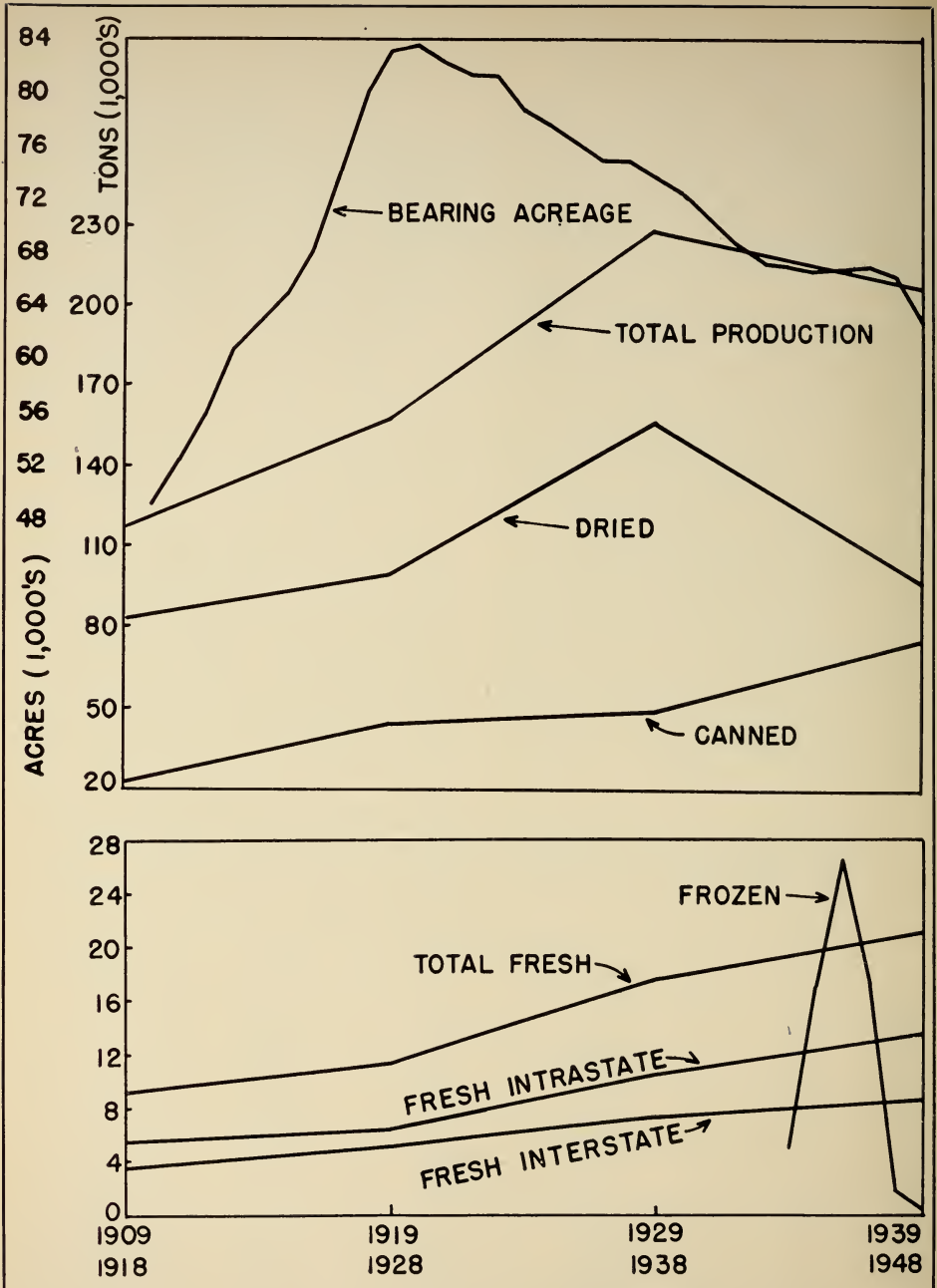

the loss of export markets, preference of the consumer for the canned product, and because of the possibility of the disposal of more fresh fruit on local markets due to the increase in the population of California during the past decade. Table 2 shows the annual distribution of production for the past 15 years.

Another important outlet for apricots is the canning industry. The proportion of the apricot crop canned has gradually increased over the years, as is shown in the graph above, and in table 2. In any given year most of the fruit not utilized by canneries will probably be dried.

**Table 2. Distribution of California Apricot Production, 1936–1948**

| Year | Distribution of production by tons | | | |
|---|---|---|---|---|
| | Fresh | Canned | Dried | Frozen |
| 1936 | 18,100 | 52,700 | 177,200 | |
| 1937 | 21,000 | 101,000 | 189,000 | |
| 1938 | 20,300 | 28,100 | 117,600 | |
| 1939 | 22,800 | 55,700 | 225,500 | |
| 1940 | 14,700 | 30,000 | 58,300 | |
| 1941 | 17,400 | 72,200 | 108,400 | |
| 1942 | 19,600 | 65,000 | 114,400 | |
| 1943 | 16,200 | 21,000 | 46,100 | 5,000 |
| 1944 | 34,500 | 128,600 | 141,600 | 17,400 |
| 1945 | 23,600 | 64,400 | 42,900 | 26,400 |
| 1946 | 26,100 | 162,000 | 98,600 | 17,600 |
| 1947 | 20,900 | 60,500 | 80,000 | 1,900 |
| 1948 | 22,500 | 101,500 | 68,200 | 700 |
| 1949 | ..... | 61,990 | 78,400 | 490 |
| 1950 | ..... | 103,750 | 77,800 | 4,100 |

Source of Data: Fruits (noncitrus) Production, Farm Disposition, Value and Utilization, 1889–1944. U.S. Dept. of Agric., Washington, D.C., Ibid.: May, 1948, 1945–1947. July, 1948.




Annual bearing acreage of California apricots, 1909–1948, with decade averages of total production and disposition of dried, canned, and fresh use. Production frozen from 1943 through 1948.

Compiled from Acreage Estimates, Calif. Crop Reporting Service, as reviewed and revised by counties and state, April 1948 (unpublished); and Fruit (noncitrus) Production, Farm Disposition, Value, and Utilization, 1889–1944. U.S.D.A., Washington, D.C., May 1948. Ibid: 1945–1947, July 1948.

Fresh consumption of apricots has averaged in the neighborhood of 10 to 15 per cent of the annual production. Somewhat less than half of this enters into interstate shipping, most being shipped to the eastern seaboard markets. The rest is consumed fresh within the state, probably a sizable fraction of which is used for home canning, and this factor should be considered when choosing varieties for planting. There has been a slight increase in the tonnage marketed fresh and this may be expected to be maintained, as is indicated in the graph.

The frozen food industry has been a rather recent development, especially in preserving of fruits. During the war years a commercially important fraction of the total production entered this outlet. However, since the war the frozen food industry has taken a smaller fraction and freezing is not now a major outlet. The future of this market is uncertain at this time, although the apricot would seem to be as well adapted to freezing as the other tree fruits.

## 5. Climatic and cultural requirements of the apricot

As mentioned above, apricots can be found growing under a variety of climatic, soil, and cultural conditions. But for commercial success the trees must have every possible advantage of favorable situation and culture.

Selection of a site for apricot production calls for consideration of three factors: soil, water supply, and climate. Of these, the latter is in many respects the most important. Each is of sufficient importance for further consideration, though a good site must rate well for all three factors.

**Natural requirements** for apricot culture include the following:

**Climate.** The apricot is more sensitive to climatic factors during the fruit-growing season than many other stone fruits, and especially in comparison with the peach. Inspection of the map on page 2 shows that the largest commercial acreages are located in relatively confined areas—in most cases more so than indicated, as the information is tabulated on a county basis only. Extremely high summer temperature during the growing season and prior to fruit maturity is damaging to fruit quality, and conducive to pit-burn. On the other hand, continued cool, damp weather may lead to the development of fruit brown rot, which is not readily controlled. In proven districts, adequate control of the blossom brown rot usually minimizes danger from fruit rot. But fruit produced in more humid regions may suffer serious transit loss from brown rot.

Thus apricots are best grown only in areas that either mature the fruit before the onset of high summer temperatures, or in areas with moderate summer temperatures, but not in cold or foggy locations.

As Tufts* has shown, apricot maturity is closely correlated with accumulation of "heat units," and it is clear that the faster these units accumulate, the earlier the fruit will mature. Therefore, certain local areas which are relatively warm in the spring and early summer may mature the fruit before the high, injurious temperatures of mid-summer are reached. Some Central Valley locations are so characterized, and constitute the early shipping sections. The apricot is not so well adapted to other Central Valley locations. On the other hand, the coastal valleys do not accumulate "heat units" as quickly, and maturity is relatively late. In spite of late maturity in these areas the maximum temperatures seldom reach the damaging point and allow the fruit to develop normally.

Unprotected coastal areas are unfavorable for apricot production because of the incidence of delayed foliation and because of fog with resulting high hu-

* Tufts, W. P. Seasonal temperatures and fruit ripening: A preliminary report. Proc. Amer. Soc. Hort. Sci. 26: 163–166. 1929.

This scene, from Blossom Hill, is fairly typical of the apricot orchards in the Santa Clara Valley.

midity, which favors the development of certain diseases. In addition, the temperatures may be too low for the development of best fruit quality.

Another climatic factor to be considered is spring frost. The apricot follows the almond in being one of the earliest of the stone fruits to bloom, and hence it is not adapted to higher elevations or areas where the danger of late spring frosts is acute.

The apricot tree becomes dormant a little later than most other stone fruits, but seldom suffers from fall frosts. It is hardier than most other stone fruits and is therefore capable of surviving in areas of low winter temperatures.

The apricot requires slightly more winter chilling than most peach varieties and some other stone fruits. If this chilling requirement is not fulfilled the apricot sheds its flower buds, resulting in reduction or loss of crop. After relatively warm winters the foliage development is practically normal. Most of the present commercial districts occasionally suffer reduced crops from lack of cold winter weather, especially with the Tilton variety, which has a higher chilling requirement than Royal, Blenheim, or most other common varieties.

Consideration of these factors, then, indicates a climate predominantly clear and dry, with only moderately high temperature during the spring and summer until the fruit is mature, and fairly cold winters, as being most favorable for the apricot.

**Soils.** As with other stone fruits, economic exploitation of apricots depends on strong, vigorous growth of the tree. This is most readily attained and maintained on deep, fertile, well-drained soils of fine texture, i.e., loams to clay loams. However, the apricot grows nearly as well on lighter soils. Sands may require heavy fertilizer applications to maintain adequate growth, and perhaps may also

require frequent irrigations. Poorly drained soils, or those underlain with shallow hardpans should be avoided. Soils with high salt concentrations, either in the surface layers or subsoil, should also be avoided for they will almost inevitably result in poor tree growth.

Sites which have previously been planted to tomatoes are to be avoided because of the occurrence in such land of a strain of the verticillium wilt organism which causes "black heart" of apricots. Other crops, such as Persian melons, strawberries, potatoes and cotton also harbor the verticillium organism, but apparently the strains developed in these crops are not so likely to cause black heart on apricots.

**Water supply.** In a few locations apricots may be successfully grown without irrigation to supplement normal rainfall. However, the bulk of the apricot acreage is grown on sites which require added water to get full production, if not to keep the trees alive. Lack of adequate water will result in weak growth, small trees, and materially decreased production. Smaller fruit will result if water from winter rainfall is exhausted before the fruit is mature.

The water source should be dependable, and afford sufficient amounts of water when needed. The water should be free of excess salts which may accumulate in the soil and damage the trees. In this regard, boron may prove especially damaging, because of the low concentrations which eventually may cause injury to the trees.

A water analysis would be helpful in determining whether available irrigation water is low enough in boron to be satisfactory for apricot trees. Water having more than 1.5 to 2.0 parts per million boron should be avoided, unless rainfall is great enough to leach accumulated boron below the root zone.

The apricot will maintain itself under rather severe drouth conditions, and is comparable to the almond in this respect. However, unlike other stone fruits, it will not form fruit buds if allowed to suffer from lack of water before or during the time of fruit bud formation—usually early to mid-July. Therefore, soil moisture should be available throughout the growing season to maintain production. Observation indicates that growers often allow their apricot orchards to become dry too early in the season.

**Special requirements.** Besides the equipment common to most orchard operations—tractor, cultivating tools, sprayer and spray facilities, irrigation facilities and equipment, etc.—the apricot grower will need some equipment more or less peculiar to apricot growing.

**Frost protection.** As mentioned above, spring frost hazards are especially great in the case of the apricot because of its early blooming habit. Therefore, practically all low-temperature injury suffered by apricot trees in California is due to spring frosts killing the flowers or young fruit. As the flower buds open they become increasingly susceptible to injury by low temperatures, and the young fruits are more susceptible than the flowers. In the case of young fruit, low temperature kills the developing embryo or seed before the other tissues of the fruit, but in such cases the fruit eventually drops, so that the crop is lost.

The blossoms and young fruits can be protected against frost by orchard heating, but several factors need to be considered in relation to the practicability of heating. The cost and maintenance of adequate heating equipment is great. The average returns from heating must pay for these costs over a period of years. Within this limitation, the factors to be considered are: The frequency and severity of frosts to be expected; the effect of frost on total production (will frost damage often limit the total state or district crop and hence cause higher returns for protected fruit); the actual cost and operation expenses in relation to the average added return, over the years.

It is assumed that apricots will not be grown in areas in which annual to nearly annual frosts occur in large numbers or are of more than moderate severity, because the cost of heating such locations would undoubtedly be too great for economical production of apricots. Loss by a rare frost, on the other hand, may well be compensated for by the lower production costs if no provision for frost protection is practiced.

Frost protection is probably more desirable in the early shipping districts. The limited production of these early areas constitutes nearly all fruit shipped to eastern markets and crop failure caused by frost in these areas will usually result in higher prices for the fruit saved by heating, and hence make heating a sound economic practice.

However, in areas producing mainly for drying and canning, added returns sufficient to offset heating costs cannot be expected because crop loss in local areas will not materially affect prices of fruit sold in these outlets.

If frost protection is to be practiced, the usual equipment is: About 100 lard-pail-type heaters per acre; several *tested* thermometers; an electric frost alarm; lighting torches; a storage tank for fuel; and a tank wagon or sled for distributing the fuel. Apricots are normally grown in districts where only a few degrees of frost occur over relatively short periods; experience has indicated that stack-type heaters are not economically sound because of the investment needed.

The operation of heaters is discussed in Section IV of this circular.

**Drying equipment.** Many apricot growers dry all or part of their crop, and for this special equipment is needed. The drying-yard space needed is approximately 1 acre for each 20 acres of orchard. A cutting shed, cutting tables, trays, fruit and pit pans, and cutting knives are essential. The size of the cutting shed and the number of pieces of equipment needed will be determined by the volume of fruit handled. When only occasional small amounts of fruit are dried these facilities may be semipermanent in nature, otherwise a more permanent setup is desirable.

Transfer tracks and trucks are necessary to carry the trays from the cutting shed to the sulfur houses. The trays used are usually the three by six foot trays. Approximately 40 trays per ton of fruit are necessary. The trays may be used three or four times each season.

The sulfur house should be of good construction; the recommended type and plan is illustrated in Exp. Sta. Cir. 382, *Sulfur-House Operations,* by H. J. Phaff and E. M. Mrak. If a large portion of the crop is to be dried, the grower may find it necessary to have more field lugs than would be necessary for other outlets. Sweating and storage bins for the dried fruit will be necessary. For this purpose one or more tight boxes of sufficient size to hold all the dried fruit will be needed.

The drying-yard and drying facilities should be so constructed and maintained that cleanliness is assured at all stages, for the tolerance for contamination is low and is likely to become more severe as time passes. Methods of maintaining cleanliness in the cutting shed are stressed in Exp. Sta. Cir. 392, *Sun-Drying Fruits,* by E. M. Mrak and H. J. Phaff. It is helpful if the drying-yard can be kept in sod, and occasionally growers have spread the trays on low trestles to minimize contamination from dirt and dust.

The normal sequence of operations in the drying-yard are discussed in a later section of this circular.

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# SECTION II - Apricot varieties

**Acceptable varieties are necessary; the grower should choose wisely for his market**

## 1. Basis for choice of varieties

In any fruit-growing enterprise, the choice of varieties is important. The grower must decide upon the type of fruit he wishes to produce, the time of harvest he wishes to have, and the outlet he will probably serve. Then he must choose the variety or varieties best adapted to his needs, often accepting some undesirable features to secure the greatest benefits.

Apricot varieties successfully grown commercially are relatively few in number, so the choice to be made by the grower is not so difficult as with some other fruits. Except for the earliest-producing areas only two or three varieties are grown commercially, and the grower should have a good reason for selecting any of the other varieties. His choice is difficult and expensive to change at a later date, for the apricot orchard will probably be a lifetime investment. Therefore, the variety or varieties to be grown should be of proven merit.

The normal outlets for apricots are for fresh use, canning, and drying. Unless the grower is located in a district which ships fresh apricots, he will be wise to plant only standard varieties suitable for canning and drying. At present these varieties are also the ones most used fresh, so he will not lose any chance to sell his fruit for fresh use. Royal, Blenheim, and Tilton apricot varieties constitute about 95 per cent of the planted acreage of the state (table 3) and a corresponding proportion of the total state production. Other varieties are grown especially for their earliness (in predominantly shipping districts) and a very limited acreage of later varieties other than these is grown for drying and local fresh markets.

Because of the variation in time of maturity in the apricot districts of the state, competition with early peaches, and because of the relatively small proportion of the crop which the fresh markets can absorb with profit to the grower, only the earliest districts regularly ship apricots to eastern markets. An early variety grown in a later district may well be too late for profitable eastern shipment, and will not have any advantage over standard varieties on the local markets. The weaknesses of these varieties, therefore, preclude their use except where they best serve the purpose of supplying early-maturing fruit for eastern markets. A limited acreage of the later Moorpark and Hemskirke varieties is still in existence, but there do not seem to be many

IN THIS SECTION

**Table 3. California Apricot Acreage by Varieties, 1950**

| Variety | Bearing acreage | Total acreage | Per cent of total |
|---|---|---|---|
| Blenheim & Royal | 37,468 | 38,843 | 82 |
| Tilton | 5,815 | 6,133 | 13 |
| Moorpark & Hemskirke | 984 | 996 | 2 |
| Others* | 1,452 | 1,531 | 3 |

* Mostly Derby, Wiggins, Steward, Riland.
Source of Data: Acreage Estimates, California Fruit and Nut Crops, 1948. California Crop and Livestock Reporting Service, 1949.

new plantings of these varieties. They tend to bear light crops, except where especially well-adapted, possibly because of their high chilling requirement. They are used almost entirely in local fresh markets and for dried fruit.

The more important varieties are listed below, with brief descriptions and their chief advantages or disadvantages.

## 2. The standard varieties

**Royal and Blenheim.** Royal and Blenheim varieties are considered together, because they have lost their separate identities. There are also several strains of each variety which differ little if any from each other, and for all practical purposes of description, use, and behavior may be considered together. Royal is supposed to have originated in France about 1830 and Blenheim in England a very few years later. Both varieties were introduced into this country at an early date. At present the two varieties together constitute about 82 per cent of the total apricot acreage of the state. The name used is more according to the section in which they are grown than to actual varieties; they are thoroughly mixed in practice with no distinguishing features known. Both varieties are adapted to all normal outlets for apricots, and are the best-known for drying and canning. When well-thinned, the fruit is sufficiently large for good shipping size, and is of excellent quality.

**Tilton.** The Tilton variety constitutes approximately 13 per cent of the California acreage, and is next in commercial importance after the Royal and Blenheim. Where well-adapted it is productive, and when properly thinned, may bear fruit that is very large in size. Tilton is adapted to drying, shipping, and canning. However, it does not rank as high as Royal or Blenheim for any of these uses because the fresh flavor is only fair, the canned fruit is bland, and the dried product a light, relatively unattractive color with a much poorer drying ratio. As it usually ripens a little later than the Royal or Blenheim, it affords some extension of the harvest season within a given district, or for individual orchardists. Tilton originated in California about 1885 as a seedling, near Hanford, Kings County.

**Moorpark and Hemskirke.** Moorpark and Hemskirke are two old European varieties that are quite similar and often confused, though the Moorpark is most often found in orchards. These two constitute a small percentage of the state acreage and are usually found in commercial orchards in the Santa Clara Valley where they are as well-adapted as any place in the state. The Moorpark especially is valued for its fine quality. The variety makes a suitable dried product, but is not liked for canning, and is too late-maturing for shipping. Both Moorpark and Hemskirke are late-

maturing varieties, ripening about a week to 10 days after the Royal and Blenheim.

The fruit characteristically ripens unevenly, one side being green ripe while the other is soft; the fruit becomes very soft when full ripe. The tree is characteristically shy-bearing. Where well-adapted the fruit is superb, and Moorpark is generally conceded to have the finest quality of all apricots, the flavor being sweet with a rich, plum-like taste. The Hemskirke is only slightly less flavorful.

Both varieties are best used fresh, though they are dried, in which case the drying ratio is intermediate between that of Royal and Tilton. The dried product is not as attractive as dried Royal fruit, and is usually variable in color, reflecting its common characteristic of ripening unevenly. Neither variety is suitable for canning.

**Newcastle.** This variety, of California origin, has nearly disappeared from commercial orchards, and is mentioned here only for purpose of record. Discovered near Newcastle in 1881, it rapidly attained prominence as an early shipping variety, and was most popular in the foothill region where it originated. It is, however, very subject to brown rot and bacterial gummosis; it flowers early, and the fruit, while of excellent flavor, is soft and coarse-textured and not well able to withstand normal shipping and handling. In addition, the fruit is completely unsuited to drying or canning. These faults have relegated the Newcastle variety to the past. It will do better than the varieties mentioned above in areas with mild winters, but its chilling requirement is not low enough for successful culture in southern California valley locations.

**Derby** (Derby Royal, Early Derby Royal). The Derby variety was first planted near Winters, California. The first orchard was planted about 1895, and upon fruiting the exceptional qualities were soon discovered. The variety matures before Royal—about 3 to 5 days in the early shipping area near Winters, to 10 to 14 days in later districts. It is preeminently suited to eastern shipping, but unsuited to drying and canning because of the tendency of the stone to cling to the flesh along the suture. Its season, earlier than Royal, is advantageous; the variety is similar enough to Royal to be shipped under that name.

The tree resembles the Royal to a marked degree in shape, foliage, and manner of spurring. The fruit also bears a close resemblance to Royal in external appearance. There is some tendency to ripen a little unevenly.

The Derby variety often tends to set somewhat lighter crops than Royal or Blenheim, and in some years shows a tendency to drop immature fruits. The "round" Derby (see below) tends to ripen its crop more evenly than the "long" type or the Royal, and is usually harvested in fewer pickings.

In early shipping districts the Derby has proved its merit as it extends the picking season, especially on the early side, and produces good-sized fruit.

Two strains of the Derby apricot have been recognized for at least 25 years. In the orchards near Winters, where the variety is grown extensively, these have become known as the "long" Derby and the "round" Derby; the latter is the desired type.

Fruit of the "long" Derby tends to be longer, often approaching oblong in shape, and is rather irregular, the suture often being quite deep. The fruit tends to be smaller, and with the irregular shape is not so well-adapted to packing, especially in the 4-basket crate. The tree tends to be more "leggy," although about as vigorous as the "round" Derby.

**Steward** (Stewart). The Steward variety is now grown only in the Winters area where it apparently originated sometime before 1891, on the ranch of J. P. Steward. It is another variety maturing before Royal, and hence extends the shipping season. Normally the Steward va-

riety matures just after the Derby, although slight differences in cultural conditions or tree age may result in reversal of this order in any given orchard or year. The Steward variety is another that is so similar in fruit appearance that it is shipped as Royal, as it differs so little from the Royal and Derby. The main differences are found in the tree.

The tree of Steward is somewhat less vigorous than that of Royal or Derby; the spur system resembles that of the Derby but Steward usually sets more spurs than the Derby (in that respect, more nearly resembling the Royal). The fruit tends to be slightly longer, averaging from round to ovate-round; in years of good color development the Steward develops more blush than either the Royal or Derby. The flesh color of the fruit resembles that of the Derby, but the stone is completely free.

The Steward is grown in relatively few orchards because it has one serious fault which many orchardists are not willing to accept. Between the time of thinning and the time of fruit maturity the Steward may drop as many as 30 per cent of the fruit on the tree. This preharvest drop usually extends over a period of three to four weeks, and ceases just as the fruit begins to mature. In orchards where Steward is grown, the practice has been to thin less than other varieties to compensate for this drop. This is not always effective, as the total drop varies from year to year and is often less in years of heavy set, when proper thinning to regulate fruit size is the most important. However, for a few growers who have cared to grow the variety it has been of some merit by extending the picking season, and giving a good succession of varieties of the most acceptable commercial type.

**Wiggins** (Wiggins Seedling). The Wiggins is another early-maturing variety which is grown only in the early shipping district around Winters. It originated in the Winters district, and was first noted by Wickson in 1909 when it was already an accepted commercial variety. There it is limited almost entirely to the nonirrigated hillsides, and is always the first variety shipped, although it is inherently little earlier than the Derby or Steward varieties. However, the trees do fairly well under the poor conditions found where they are grown, and the fruit can be picked at a relatively immature stage and still ship satisfactorily. Being the first shipped, the prices have been profitable, although the returns for this variety suffer as soon as an appreciable quantity of the better varieties reaches the markets.

### 3. Some new varieties

A few new, relatively untested varieties are available or are being grown in small plantings throughout the state. Some of these are briefly described below.

**Riland.** The Riland variety originated with Harry Yount, Douglas County, Washington, in 1929. The tree and fruit differ considerably from the types described above.

The tree is rather upright, the leaves large, very dark green, thick; the shoots are thick and require careful training because of the upright habit and tendency to branch sparingly. The spurs are thick, short, strong, but fairly short-lived, and may be rather sparse.

The fruit is nearly round, well-covered with a very fine, velvety pubescence. The color is yellowish-orange to deep apricot, covered with a brilliant red blush which may cover up to half the surface where exposed. The flesh is thick, meaty, deep orange colored; somewhat fibrous and coarse, but with a rich, plum-like flavor. The Riland is a very attractive apricot when properly grown; it is not suited to canning and drying, however, and therefore enters the fresh fruit market only.

The fruit varies somewhat in different localities in its time of maturity in relation to Royal. Introduced as an early-maturing apricot, it has proved to be

three to five days later than the Royal in the Central Valley apricot districts. In the Hemet area of southern California it may mature as much as a week before Royal.

Experience in California indicates clearly that the trees should not be kept too vigorous, as the fruit, though then of very large size, tends to crack along the suture, develops very poor color, and it is liable to break down readily. When grown in a less vigorous condition, the fruit is considerably smaller, though equivalent to well-grown fruit of other varieties, but is much more attractive and better to handle. Also, when heavily cropped the tree becomes more spreading, branches freely and is easily trained. The variety is self-unfruitful, though it produces good pollen, and hence provision for cross-pollination must be provided. Any other variety now being grown will prove satisfactory for this purpose.

Because of its growth habit, the variety tends to come into production a little later than the standard varieties. This tendency is partially overcome by keeping the trees less vigorous, pruning rather lightly until they start to bear, and providing an adequate pollen source.

**Perfection.** The Perfection variety also originated in the state of Washington as a chance seedling planted in 1911, by John and Bertha Goldbeck of Waterville. The variety was introduced in 1938. It is a moderately early variety, and although not adequately tested in California appears to be promising as an early shipping variety. It matures about a week to 10 days before Royal, depending on the district and season.

The tree is a rank grower, with a decided tendency for the long terminal growths to turn downward. This results in a spreading tree, but normal pruning practice will develop a well-shaped tree. The weeping terminal growths are normally removed in pruning, and there are enough upright growths to form a well-shaped tree. The tree is very vigorous; the foliage is of the same color as the other standard varieties, but the leaves are a little larger, and the serrations along the margin tend to be more pronounced.

The fruit is oval to oblong, a little rough on the surface, but of large size, even with heavy crops. The fruit color is a clear yellowish-orange to deep orange at full maturity; there is no blush. The flesh is yellowish-orange; the quality rather good; the texture satisfactory. The stone is large, in keeping with the fruit. This is probably the largest-fruited apricot available at present.

The variety has been shown to be self-unfruitful in Washington and California. Therefore, like the Riland, it requires cross-pollination. All other common varieties will serve, including the Riland. The Perfection blooms a little earlier than most other varieties.

As Perfection has been grown less in California than even Riland, it is not recommended except on a trial basis until more is learned of its characteristics in California orchards. It can be dried, but does not have a good drying ratio, although the large fruit results in a rather attractive product. The canned product is attractive but of mediocre quality. Hence Perfection seems to be of most value for dessert purposes. Its early season and large size are favorable for this market. There is some evidence that it may prove to be adapted to southern California, as it seems to have only a moderate chilling requirement.

**Other varieties.** Most apricots have a rather high chilling requirement, and hence do not do well in areas with warm winters, especially in southern California. A few varieties have been selected which have low chilling requirements, and which do well in such areas, other conditions being favorable. The Earligold and the Reeves are two such varieties, but until more is learned about them, they are to be recommended only as home

orchard varieties for such locations. The Earligold is much like the Newcastle mentioned above, and seems to possess the major faults of that variety. At the time of this writing the Reeves had not been observed.

Other varieties are occasionally encountered, but none has attained full commercial acceptance. Many have been tried in the past, but have proved unsatisfactory for one reason or another. New varieties are appearing, but should be planted with caution until more is learned about them. All varieties are not equally well-adapted to the drying and canning outlets, hence the commercial grower should be careful of new, untested varieties which otherwise appear promising, especially if he is going to rely on these outlets for disposing of the bulk of his fruit. The willingness of canners to accept a new variety should be ascertained: drying and refreshing tests can be used to determine the quality of the dried product. Royal, Blenheim and Tilton have been exceptional varieties because they have been readily accepted for shipping, drying, canning, and freezing; new varieties may fail in one or more of these outlets.

## 4. Adaptation of varieties

Those apricot varieties with low chilling requirements have been discussed above; they are the varieties best suited to southern California valley climates. Royal and Blenheim will not do well in southern California except at higher elevations, as in the Hemet area where Royal is grown in quantity. Moorpark and Hemskirke would not be adaptable to these areas, and Tilton would probably fail in most years. In the coastal valleys and Central Valley, all of the varieties will do well, but as emphasized in the introduction to this section, the proposed market outlet must be considered in connection with the response of the particular variety to the local climate. Thus, experience has shown that Derby, Steward and Wiggins are profitable varieties only in the early shipping section around Winters, while Royal and Blenheim can be grown in all sections having severe enough winters for adequate chilling.

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Apricot Culture
IN CALIFORNIA
CLARON O. HESSE
CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service
CIRCULAR 412

# SECTION III - Getting into business

**Starting the orchard requires operations not repeated during the life of the trees**

Planting an orchard properly requires a well-founded plan including the following operations: preparing the land; installing the irrigation system; laying out, or locating the tree positions; planting, and caring for the young trees.

## 1. Preparing the land

It is important to grade and prepare the land so that it will conform to the planned irrigation system and facilitate the distribution of water. Except for that purpose, there is little point in grading orchard land unless the removal of gross irregularities will aid other orchard operations. The amount and kind of grading will therefore depend a great deal on the type of irrigation plan to be followed. Basin and furrow irrigation will require greater attention to proper grading than contour basin irrigation schemes, though some grading may well be advisable for contour irrigation. If possible, deep scraping which will expose infertile subsoil should be avoided.

IN THIS SECTION



## 2. Methods of irrigation

Irrigation is necessary in practically all successful apricot orchards. Some thought should be given to the type of irrigation system to be used, and installation of necessary equipment and land preparation should be made before the orchard is planted.

Choice of a method of irrigation will depend on such factors as the type of soil, topography and slope of the land, the head of water available, and the relative costs of installation.

The ideal irrigation layout is one which permits wetting the soil in the entire orchard to a uniform depth with a minimum of hand labor. The most common methods of distributing water are discussed below.

**The basin method.** In general, where the land is nearly level the basin method is used. This method consists of square or rectangular basins enclosing one or more trees. The water is allowed to fill one basin to the desired depth, then it is diverted into the next basin and the first one is closed.

**Contour checks.** Another method now used rather extensively is the contour check method. In this system, the levees follow contour lines instead of the

straight lines between tree rows. The number of trees enclosed by the levees in this system varies from 5 to 20 or more trees. The position of these contours is determined by a surveyor. Colored marks on the trees guide the operator building the levees. This system has proved to be economical as far as labor is concerned, but the tendency to include too many trees in each basin results in an uneven wetting of the soil. The contour interval should not be more than 0.2 foot; if this interval results in larger basins than the head of water justifies a smaller interval should be used where needed.

This method is discussed more fully in Ext. Cir. 73, *The Contour Check Method of Irrigation*, by J. B. Brown.

**The furrow system** consists of several furrows between, and parallel to the tree rows. It is used by some growers who have well-graded orchards and facilities for distributing small streams of water down a number of furrows at once. This system requires comparatively little labor but often has the disadvantage of supplying too much water at the upper ends of the furrows and not enough at the lower, especially when the furrows are long.

Another method of applying irrigation water (not used extensively in apricot orchards) is by contour furrows, in which the rows of trees are planted on contours according to grades established by a surveyor.

**Sprinkling** is developing as a highly satisfactory method of irrigating orchards on slopes so steep that the methods described above are not feasible. Installation costs are high, but on such sites water can be applied evenly to the desired depth by this means only. Once installed, operation costs are low. Few irrigated apricot orchards are located on such sites.

**The strip check method** is used in a few localities where large heads of water are available, for example in the Central Valley from irrigation canals. The plan is similar to that commonly seen in alfalfa fields. The strips may contain one or more rows, depending on the slope of the land and the available head of water. The land must be well-graded to use this method, as the strip checks may be the length of the orchard—up to several hundred feet.

Consideration of *frequency of irrigation* is discussed in Section IV of this circular.

## 3. Laying out the orchard

Most California orchards are planted by the square system, in which the trees and rows are the same distance apart. However, other plans which have some merit are the hexagonal system, by which approximately 15 per cent more trees are placed on a given area of land than is possible with the square system; and, in hilly, easily eroded locations, the contour system. Details for laying out an orchard by these methods may be secured from the reference listed below.* As the square system is so widely used, it has apparently best met the needs of most California orchardists, and departures from this method should be made only after careful consideration.

There are several methods of actually laying out the orchard and determining the tree positions. In all but the smallest plantings it would seem advisable to have at least the base lines established by a surveyor, or a person with experience in laying out orchards. Such a person is usually to be found in any fruit-growing district. After the base lines are established, the tree locations may be located by use of a measuring tape or wire, or by sighting. Any method which results in placing the trees in straight rows in the orchard economically is satisfactory.

* Wickson, E. J. California fruits and how to grow them. 10th ed. (see especially p. 85–92) Pacific Rural Press. 1926. This book is currently out of print, but is available in many libraries in the state.

## 4. Selecting rootstocks

The principal rootstocks used for apricot are seedlings of apricot, peach and myrobalan plum. While disease and soil troubles appear to be most important in selecting a rootstock for apricots, many locations seem to be relatively free from serious problems in this respect. In such locations either peach or apricot rootstocks seem to give about equal results. However, if apricots are planted to a site previously in orchard on peach root, the apricot root should be used. Apricots on peach roots sometimes grow less vigorously than those on apricot roots in such situations.

In locations where particular diseases or soil troubles are known to exist, the following list indicates some other possible rootstocks which may prove preferable.

**Excess moisture** in amounts which will damage trees on apricot or peach rootstocks will usually not harm apricots on myrobalan seedlings or Marianna rootstocks. A small percentage of myrobalan seedlings make poor unions with apricot varieties; in these cases the trees either make poor growth, or break at the union under the stress of winds or heavy fruit loads.

**Bacterial canker** will attack trees on myrobalan more readily than those on either peach or apricot.

**Armillaria** (oak root fungus) spreads more slowly in an orchard on myrobalan than on other rootstocks. Certain vegetatively propagated plum rootstocks, as Marianna 2624, appear promising for use in oak root fungus spots.

**Pacific peach twig borer** attacks are much more severe at the root crown and graft union when apricot is grown on myrobalan roots; and less severe on apricot roots than on peach.

**Root-knot nematode** attacks, which are usually more serious in sandy soils, can be avoided by growing apricot on apricot root, as it is immune. Some of the nematode-resistant peach, myrobalan, or Marianna plum stocks may also be used. In the case of the plum stocks a vegetatively propagated strain is used such as Myro 29 or Marianna 2624, because not all seedling plums are resistant. S-37 is a recommended peach stock for such sites.

**Crown gall** attacks all of the above rootstocks, though peach seems to be somewhat more susceptible.

**Pocket gophers** prefer the apricot to all others.

## 5. Propagation

Orchardists seldom grow their own nursery trees. The care and techniques used are not those associated with fruit growing, and are generally done better by nurserymen specializing in the production of fruit trees. However, a few may desire to produce their own trees. The details of the various steps involved are given in Ext. Cir. 96, *Propagation of Fruit Plants*, by C. J. Hansen and E. R. Eggers. The procedure is merely outlined below.

Seeds of the desired rootstock species are obtained, stratified, and grown in a nursery which should receive the best garden care. After the seedlings are well-developed (midsummer or later) and while the bark still slips readily, the trees are budded with buds of the desired apricot variety near the ground line. The following spring the tree is cut back to the bud, which develops and thus forms a tree of the desired variety in the following summer. This method of propagation can be shortened to one year by the so-called June-budding method, if vigorous peach stock is used, but this procedure is not as commonly used for apricots as for peaches.

## 6. Nursery trees—care and planting

**Care of nursery trees.** If purchased, nursery trees should be ordered early to insure getting the desired variety and grade. On delivery, if they cannot be planted at once, they should be un-

packed and heeled in by placing the trees in a trench side-by-side at about the same depth as they grew in the nursery. Commonly they are placed at an angle, with the tops pointing to the south, so that the trees receive the minimum direct sunlight. Loose, moist soil is sifted and packed around the roots; the trees may be watered in by tanking if the soil is on the dry side. It is of the utmost importance to keep the roots moist. However, the soil should be well drained. If the trees appear to be dry when received, they may be soaked in water for 24 hours before heeling in; or they may be completely covered with moist earth for a few days.

If the trees are produced by the grower they may be dug as they are planted, although it is usually simpler to dig all the nursery and heel the trees in where they will be available as needed.

Trees properly heeled in may be held for a considerable period, certainly until proper planting time or later, even though they are delivered at a rather early date.

**Grades of nursery trees.** Trees purchased from commercial nurseries must conform to the regulations set forth in the Agricultural Code.* For yearling trees, the minimum size is ¼ inch caliper two inches above the bud, and the trees not less than 8 inches tall. The grade sizes are in increments of ⅛ inch up to ½ inch, and then in 3/16 inch series. The tree height may also be given, such as 4 to 6 feet, 3 to 5 feet, and 2 to 3 feet. June-budded trees may have a minimum caliper of 3/16 inch, and may be graded in 1/16 inch intervals up to ⅜ inch. If the tops of such trees are over 1 year old, the age should be shown on the label. The trees should be healthy.

Trees of medium size—about ½ inch caliper—usually make the best growth in the orchard.

* Extracts from the Agricultural Code of California. State Department of Agriculture, Sacramento. Sept., 1947 (rev.).

**Spacing.** Apricot trees are vigorous, long-lived, and hardy. They may grow to very large size. It is desirable not to let the trees become larger than economical harvesting allows, but they normally require more space than peaches or most plums.

**Recommended distances** are from 24 to 30 feet. General observation indicates that distances of 25 to 27 feet are best. At these distances, except under the most vigorous growing conditions, the trees will not grow too rapidly to be properly shaped and kept in bounds by pruning.

Apricot trees will readily use a larger spacing, but there is danger of the trees getting too tall at the 30-foot spacing, and, if kept down by pruning, excessive top growth may result, or the branches will be too long and flat, and require expensive propping. Planted at 24 feet, vigorous trees soon become crowded. There may be merit in planting by a rectangular plan, using distances of 24 or 25 feet by 30 feet. Such plantings are not common, so it is not certain they will be better suited to the apricot than the square system.

**Time to plant.** In California, dormant nursery stock is usually planted in the spring. Fall-planted trees may tend to dry out if long, dry periods occur during the winter, and nursery stock is more easily tended when heeled in. However, planting should be done early in the year (January or February). Normal nursery delivery is usually after the first of the year, so that the trees may often be planted soon after they are received from the nurseryman. Planting may be done as late as March, or later if the trees are kept dormant in cold storage. Late planting is not recommended, and should be avoided if possible.

**Moisture at planting.** Planting should be done in moist soil. If rain does not come soon after planting, it is advisable to either irrigate or tank water to the trees to settle the soil around the

roots, and to keep them damp. If planting must be done in dry soil, tanking or irrigating immediately after planting is necessary.

**How to plant.** Unless the soil is in poor physical condition, due to grading operations or other causes, the holes for planting the trees need be only large enough to receive the roots without bending or cutting. Unduly long roots may be shortened; broken ones should be removed. The soil should be sifted between the roots and firmed, either by tamping or by settling with water. A well-planted tree with a normal root system is not easily pulled from the ground after being set. The trees should be planted at the same depth at which they grew in the nursery. This is usually determined easily by the position of the bud union, and differences in bark color at the old ground line. Diseased or pest-damaged trees should be discarded.

When apricot trees are properly planted, start growth promptly, and are grown from healthy nursery stock, they need little additional attention. However, it is sometimes advisable to protect them from sunburn. This can be accomplished by the use of tree protectors or whitewash. The protectors may interfere with normal development and should be removed when growth becomes active. Protectors also afford protection against rabbit injury where such damage is common. Whitewash is sastifactory for protection against sunburn, but should be applied down to the soil. Applying whitewash at time of planting and before the holes are completely filled in will insure better protection to the trees under most circumstances.

A satisfactory whitewash formula can be made as follows: 5 pounds quicklime, ½ pound salt, and ¼ pound sulfur. Add the salt and sulfur while the lime is slaking. Age several days before use. Whitewash can be applied with a brush, or sprayed. Trees should be watered frequently during the first year.

## 7. Starting young trees

After the orchard is planted and the trees are growing, they should be kept growing vigorously. Clean culture is usually practiced.

However, many orchardists wish to grow intercrops in the young, developing orchard. As long as such intercrops do not interfere with the development of the trees they are not objectionable. In a good soil, and with plenty of moisture the intercrop and the trees may both do well, but the grower should remember that the trees are the main crop.

Tomatoes never should be used as an intercrop because of the occurrence of verticillium. For the same reason, land previously in tomatoes should not be used for an apricot orchard. Cotton, potatoes, strawberries, and Persian melons also harbor the verticillium organism, but the strains developing on these crops are not quite so likely to cause black heart of apricot.

**Fertilization.** In soils of low fertility, the trees may well repay small nitrogen applications, but only under most unusual conditions will other soil amendments be practical. Young trees should receive only about ¼ pound of ammonium sulfate (or equivalent amounts of other nitrogenous fertilizers) scattered in a small circle around the tree. Since the roots will all be fairly close to the tree position during the first summer, broadcast applications will largely be unavailable to the tree. Care should be taken to avoid getting the fertilizer directly on the trunk of the young tree.

## 8. Training and pruning young trees

The terminology and practical aspects of pruning may be learned from Ext. Cir. 112, *Pruning Deciduous Fruit Trees*,* by W. P. Tufts. Although an abridged description of the pruning method described in Circular 112 is given, the

* This circular is currently out of print, but may be seen in many public libraries throughout the state.

discussion of pruning below is concerned mostly with the *problems* which may arise in pruning by the methods described in Circular 112, and *why* the corrective suggestions are made. In different localities there may be some variation in the exact or detailed nature of pruning to adjust for local climatic and cultural conditions.

As outlined by Tufts, the purposes of pruning are: To produce vigorous, mechanically strong, healthy trees, free from sunburn, and capable of producing heavy crops over a long period of years; to secure a tree well-shaped for convenience and economy in orchard management; to distribute the fruiting area well over the tree; to insure a succession of profitable crops; and to secure the desired size and quality of fruit. This section is devoted to the first two purposes of pruning; the last three purposes are covered in Section IV.

All pruning is in a sense devitalizing, and reduces the total growth made by the tree. However, the value of pruning is apparent in the forming of trees suitable to general orchard management, harvest operations, and of good productiveness. The objective of pruning should be to secure these benefits with the minimum removal of wood from the growing tree.

**Pruning at planting.** As the tree is received from the nurseryman, the root area has been greatly reduced in proportion to the top by loss of roots in the digging operation. It may also be necessary to cut out or shorten intertwined or damaged roots. After the tree is planted, the top is cut back. This is mainly to reestablish the balance between roots and top, but also to regulate the height of the growth from the young tree because these new shoots will become the main framework branches, or primary scaffolds. Therefore, trees are cut back to a height of about 24 inches at the time they are planted.

Apricot trees usually develop numerous branches in the nursery—in contrast to some of the other deciduous fruit trees, which may be unbranched whips. Often these branches may be utilized in establishing the location of the primary scaffolds at the time of planting. If they are to be used, they should be carefully selected for spacing up and down and around the trunk of the tree. They should be no more than three in number, including the topmost branch, or extension of the trunk, and they should be fairly vigorous. If selected, they should be cut to 4–6 inches long. (The spacing of the primary scaffolds is treated more fully in the section on the first dormant pruning, the time when such scaffolds are usually selected.)

All other branch growth should be removed from the trunk, but the cuts should be made so as to leave short stubs; cutting too close will often result in killing the buds at the base of these small branches, if not in their actual removal.

**Pruning the first summer.** Normal pruning practice delays selection of the main scaffold branches until the first dormant pruning, but in many locations the vigorous growth made in the first summer could be profitably directed to formation of permanent parts of the tree. This would result in fewer pruning problems at the time of the first dormant pruning, and would substantially reduce the amount of pruning needed. For this reason, the method is given in some detail.

The apricot tends to develop many branches during the first summer in the orchard, some of which cannot be utilized for shaping the tree. Beginning when the young growth is 3 to 4 inches long, judicious pinching of some of these young shoots will throw most of the growth into unpruned branches, and aid in shaping the tree. Such pinching should not remove the growth entirely; a few leaves should be left to protect and help nourish the tree. Properly performed and followed up, such summer pruning will materially reduce the amount and severity of the first dormant pruning, even though the

Note the large cuts on this apricot tree that were necessary to remove extra branches at the point of heading the previous winter.

## Judicious summer pruning makes large cuts unnecessary later.

Selection of main scaffold branches was made during summer pruning on this tree. Note absence of large cuts. Compare this with the photo above.

tree makes less total growth as a result of the practice. Selection of growing shoots to be encouraged is discussed below.

**First dormant pruning.** Normally trees are not pruned from the time they are headed back at planting until the end of the first growing season. If, as is usual, no primary scaffold branches were selected at the time of planting, or by summer pruning, this very important operation is accomplished at the first dormant pruning. Careful consideration should be given to their spatial relation to each other, their height above ground, and to the kind of crotches they form with the trunk.

Three main scaffold branches should be selected. More will almost certainly result in eventual crowding of the main branches (see photos), and often make large, weakening cuts necessary in later years. If three suitable branches are not available two will serve.

The scaffolds should be spaced 6 to 8 inches apart up and down the trunk. They should be distributed equally around the trunk. All other branches are removed from the tree. Small spur growths on the trunk may be left with advantage, as they will seldom grow vigorously, but will develop a few leaves to shade the young trunk the following summer.

Good distribution of branches, except that the weak central branch is being crowded out by large branches below. Crotches are strong, however.

After the three main scaffolds are selected, they are headed, or cut back, usually about waist to breast high. This height will usually result in scaffolds about 2 to 3 feet in length. Heading at such height assures proper branching for selection of secondary branches the following year. If growth has been sufficiently vigorous, the primary scaffolds may be left longer and secondary branches selected (see second dormant pruning).

The scaffold branches should not be cut the same length. It is important that the uppermost branch, or leader, be left somewhat longer than lower branches. This will insure that it will not be choked out by vigorous growth of the lower branches in succeeding seasons (see photo). In addition, causing the uppermost branch to grow faster than the lower branches usually results in the formation of strong crotches where the latter unite with the trunk.

If it has been necessary to select two strong branches near the top of the trunk for scaffolds, the danger of forming a weak crotch because of the two rather equal branches arising at the same location may be avoided by heading back the lower branch rather severely. Similarly, if only two scaffold branches can be selected at the end of the first growing season, the lower should be rather severely headed in relation to the uppermost branch. In such cases the third scaffold will be selected the following season.

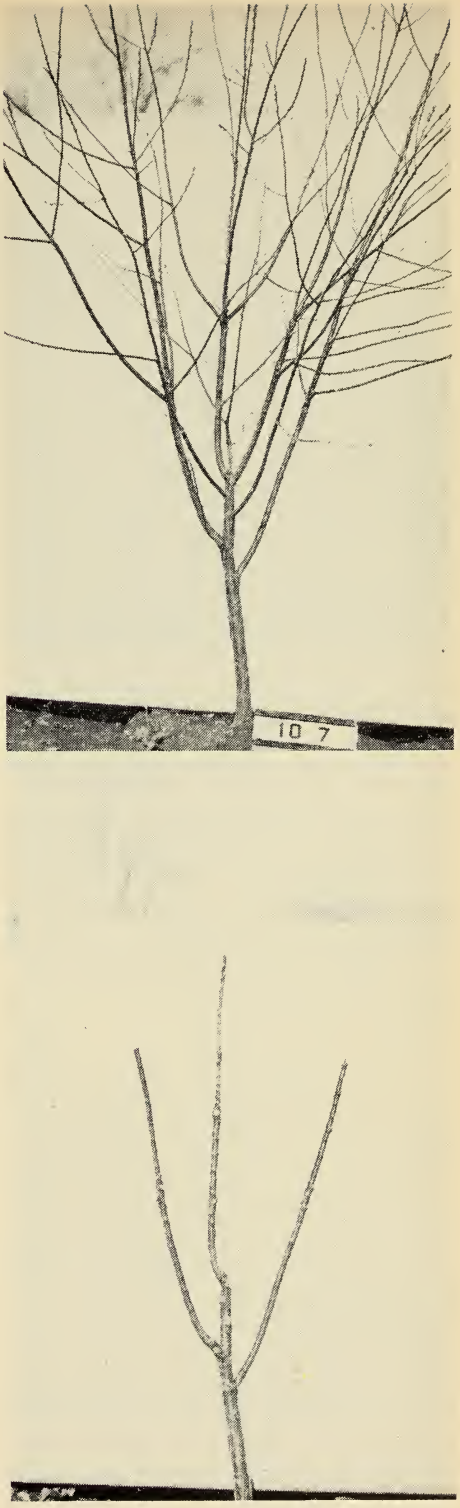
In those cases where the lower branches tend to be much more vigorous than the uppermost scaffold selected, the latter may be left unheaded, while the lower scaffolds are headed severely. All of these recommendations are designed to keep the uppermost branch, or leader, growing

more vigorously than lower branches. If this goal is attained, there will be little trouble from weak crotches, or with choking out of branches in later years.

Vigorous young apricot trees often produce whorls of small laterals at points along the branches. These are desirable on older trees, but on young trees may result in undesirable growth, and they should be reduced in number where they occur, especially at points where secondary branches are desired.

**Pruning the second summer.** Normally no pruning is given the second summer. However, the apricot often produces a large number of strong, vigorous laterals low on the scaffolds, or even on the trunk. These may be cut out to help in cultural operations, and to aid in forming strong framework branches. Very vigorous trees will often produce whorls of strong, leggy branches immediately below the point of heading at the time of the first dormant pruning. In windy locations these may be blown out as they become top-heavy. In such cases, it is often advisable to remove some of these branches, leaving two or three to select among at the next dormant pruning; and to thin out, or even shorten somewhat by cutting to a smaller, well-placed, lateral branch. This tends to thin out the foliage, making the branches less susceptible to injury from wind, and to aid in keeping the main scaffold branches in proper shape (see photos on page 7). Under average growing conditions, such pruning is not necessary.

**Second dormant pruning.** After the second summer in the orchard, the young apricot tree has usually produced a large number of strong laterals along the main scaffold branches and often on the trunk as mentioned above. All such lateral branches except the short growth




Top, a vigorous tree after one season in the orchard. Note available scaffold branches. Bottom, the same tree after pruning. Note spacing of scaffolds.

A two-year-old apricot tree before and after pruning. Note excellent distribution of main and secondary scaffold branches.

under 4 or 5 inches long should be removed up to a point where the secondary framework branches are to be located, usually about breast to shoulder high (see photos above.

The number of secondary branches to be left will depend somewhat on their size and location. Five to 7 secondary scaffolds, breast high, will be sufficient; the smaller number is preferred. Care should be taken to see that they are well-spaced around the tree, as their normal growth will result in crowding at a later time if they tend to occupy the same space. All other branches are then removed, except the short growths as noted.

At this age, it is still necessary to favor the topmost primary scaffold, or leader, by lighter pruning to insure that it remains the dominant part, and branches on the scaffold should be treated after the same principle. The main scaffold, or continuing branch, should be left longer than shoots branching from it. This is accomplished by thinning out or heading back such lower branches if necessary. Such pruning insures strong crotches in the upper framework of the tree in the same manner that unequal cutting of the primary scaffolds was used to secure strong branches from the trunk.

Toward the outer ends of the scaffolds smaller branches may be found in some number, although the apricot tends to produce fewer of these than the peach. They should be thinned out by removing some of them as needed so that the tree appears to be in proper balance. If the growth of the previous season has been very vigorous, it may prove necessary to shorten the length of the scaffolds by cutting back to one of the lateral branches.

**Third and subsequent dormant pruning of young trees.** After the third full season of growth in the orchard, the tree will start bearing considerable fruit. However, for one or two seasons longer the dormant pruning is as much concerned with the shaping of the tree as with fruiting, although the latter becomes

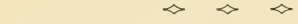
increasingly important. Growth of the scaffold branches is encouraged, and new branches are selected at intervals, so located that they tend to fill the space through the tree with strong, healthy branches. Pruning at this age, therefore, is essentially a matter of thinning out excess branches, and cutting out those which tend to cross or interfere with more desirable branches.

There will probably be some strong watersprouts from the scaffolds near the points of previous cuts which will also need to be removed. The tree should be thinned sufficiently to permit full development of the remaining branches and to admit light to the center of the tree to encourage the growth of fruit spurs on the larger branches. This is important, because killing out of fruiting wood through the inner portions of the tree materially reduces the production potential, and such growth is replaced slowly once it is lost.

Trees at this age often produce long annual growth, and the weight of the foliage, new wood, and sometimes fruit, tends to bend the branches downward to the extent of interfering with cultural operations. Such branches can be redirected upwards by cutting back to an upward growing lateral. The necessity for this disappears as the tree becomes older.

As the trees reach the height at which they are to be held, all the top branches are headed at the same height, and the leader largely loses its identity, although it has served its purpose in securing a strong, well-branched framework. However, the leader will often reach the maximum height a year or more before the other branches. The latter are then allowed to catch up as soon as they will.

After the maximum height is attained (assuming a wise choice of scaffolds and branches) the shaping function of pruning is largely replaced by pruning to induce annual, heavy production of good-sized, high quality fruit.



The pruning operations needed by bearing trees are discussed in section IV of this circular.

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Apricot Culture
IN CALIFORNIA
CLARON O. HESSE
CALIFORNIA AGRICULTURAL Experiment Station Extension Service
CIRCULAR 412

# SECTION IV-Management of the bearing orchard

**These operations are repeated annually and are directed at obtaining good yields of quality fruit**

After the third or fourth season of growth, vigorous apricot trees will begin commercial production, and will nearly fill the space allotted to them in the orchard. From this time on orchard management will be directed toward maintaining tree vigor, uniform annual crops of quality fruit, and performing the cultural operations necessary to keep the orchard free from diseases and pests. The operations will then fall into a routine cycle.

One of the most important operations is the pruning of bearing trees.

## 1. Pruning bearing trees

The pruning of a bearing tree which has been properly shaped and formed to occupy its allotted orchard space becomes, after the third or fourth year, a matter of establishing the height of the tree, regulating crop, and maintaining bearing wood—in this case spur growth.

Best tree height will be determined by the ladders used for pruning, thinning and harvesting. Ten- or 12-foot ladders (preferably the former) are most commonly used in the apricot orchard. When 10-foot ladders are used scaffold branches should be headed at a height that will make them convenient for a pruner standing on the next-to-top ladder step—this will be about 16 to 17 feet from the ground. For the 12-foot ladder, the height will be about 2 feet greater. Once established, this height is maintained by annual thinning out of all but one of the strong growths which will develop at this point. Whether or not the remaining shoot is left long or cut to a few buds seems immaterial.

**Crop regulation** by pruning is obtained mostly through the control of the number of spur-bearing branches allowed to remain through the top of the tree. Spur thinning or removal is not practiced as a means of controlling crops because of the short life span of the spurs, the dangerof loss of spurs from disease (especially brown rot), the variable climatic influences which often result in light sets, and because of the ever-present danger of crop loss from spring frosts. The apri-

IN THIS SECTION

cot grower prefers not to limit the producing capacity of his tree; the crop load can be reduced by thinning if it proves to be too great. However, the potential bearing area may be kept in reasonable bounds by limiting the number of fruiting branches, a practice necessary to maintain adequate bearing wood.

While some fruit is borne from lateral flower buds on one-year-old wood, this is not an important source. The main crop is borne on the spurs found on two-year and older wood. The maintenance of this spur system on older wood is therefore of great importance.

It is best maintained by thinning out the top growth, thus allowing sunlight to penetrate to the inner portions of the tree. Under such conditions, spurs on the inner branches will remain alive, and new shoots will arise each year throughout the inner and lower portions of the tree from the older branches and scaffolds. By judicious choice, enough of this new growth may be kept to develop new bearing areas, low on the main scaffolds or even on the tree trunk. If the trees are allowed to become crowded through the top, shading will soon destroy such wood, and it will not be replaced by new growth unless drastic cuts are made.

Dormant buds on old wood exposed by shallow trimming. If exposed to light by pruning or cutting back, these buds will grow.

The fruiting surface around the outer areas of the tree, where most of the strong shoot growth takes place each season, is easily maintained by thinning out excess branches. The selected branches should not be cut back unless excessively long and then only lightly to keep them in proportion to the space to be occupied. As the apricot tree matures and starts bearing heavy crops it tends to spread; therefore it is necessary to select new growth directed toward the center of the tree to fill in the top of the "vase" which has been formed by earlier pruning. Strong, well-spaced shoots, arising from the inner side of the main scaffolds or secondary scaffold, are usually selected. These in turn will have to be headed at the selected height but should be kept from becoming too vigorous because they will be most likely to shade out the lower portions of the tree. Annual thinning out of the growth from these branches will accomplish the desired end; if the growth is vigorous it may be subdued by cutting to a small lateral. The proper selection and maintenance of these branches will add greatly to the bearing capacity of the tree.

As has been emphasized in this discussion, shading out of wood in the lower portion of the tree is to be avoided. For a given location and tree spacing the number of branches to be left can well be judged by the annual growth made through the lower portion of the tree. If such growth is sparse, weak, and not sufficient to replace natural spur loss, thinning out some of the upper branches is indicated. Drastic cutting is seldom needed in such cases; a few branches cut out will allow sunlight to penetrate into the tree and this will stimulate dormant buds carried near the surface of the bark on old apricot branches. (See photo.)

A five-year-old apricot tree before pruning. Note the great amount of excess wood.

## Pruning bearing trees is mostly a process of thinning out excess wood.

The same tree shown above after pruning and thinning out of branches.

Occasionally important branches of the tree become weak, diseased, or lose their bearing wood, making it desirable to replace them. If it is desired to stimulate some of the dormant buds mentioned above, cutting back the branch will usually accomplish this, and replacement may be made from one of the resulting shoots.

After well-developed trees attain full size, pruning becomes largely a matter of annual thinning out of excess growth, cutting out occasional weak limbs, and their replacement by properly directing new growth. Normal replacement of the short-lived spurs will be readily accomplished from the annual new growth throughout the tree.

**As the trees grow older,** the length of the new wood produced annually decreases. In healthy, old trees, new wood should make from 15 to 30 inches of growth through the top of the tree each year; if less, more severe cutting should be practiced. Because of the relatively short life of the fruiting spurs, the apricot tree is pruned more heavily than most other spur-fruiting species such as sweet cherry and European plum, whose fruiting spurs are longer-lived.

A large pruning wound. The cut was made properly but the large size, unprotected, has allowed wood rots to enter before healing was complete.

Although there are modifications in pruning practice from district to district, growers generally realize the necessity of maintaining an approximate balance between the crop and the amount of new growth produced under the soil and climatic conditions of the particular section.

**Treatment of pruning wounds.** Properly pruned trees seldom show wound scars of sufficient size to need protection; wounds which will heal in one or two growing seasons do not need care. However, if through breakage or other cause large wounds are necessary, it is well to protect them from drying out and checking which leads to invasion of wood rots. Such rots may in time cause the loss of large limbs, if not of the tree. Cold grafting waxes (asphaltum water emulsions), bordeaux paste (bordeaux mixed with water) or bordeaux paint (bordeaux mixed with raw linseed oil) may be used to protect such wounds.

Wounds heal better and more quickly if the cuts are made against the parent branch and parallel to it. Any stubs left will not heal over, but will die back to the branch, and leave a permanent entrance for wood-rotting fungi.

## 2. Cultivation

Cultivation, even in so-called clean-cultivated orchards, is practiced at present to keep down weed growth (thereby conserving water that the weeds would use), and to facilitate orchard operations.

Normally a planted or a weed covercrop is grown in the winter. If planted, a seedbed is prepared. Otherwise, the weeds develop after the last summer cultivation. In spring the covercrop is disked under. Thereafter, cultivation with disk

Disk and drag harrow at work in an apricot orchard near Hollister, California.

or spring-tooth harrow is done only as required to keep the weed growth from using up too much moisture. In some soils it is necessary to break down irrigation levees between each irrigation because the soil shrinks on drying and forms cracks which will cause the levees to leak at subsequent irrigations. Where this condition prevails, and weed growth is light, it will be necessary only to break down the levees and then rebuild them before the next irrigation. However, where weed growth is excessive, the whole orchard area, including the levees, may have to be cultivated.

Orchards are often cultivated in the fall to facilitate winter operations of pruning and spraying. At this time they are often floated to restore levels.

For a more complete discussion of cultivation, and the following subject, irrigation, see Ext. Cir. 50, *Essentials of Irrigation and Cultivation*, by F. J. Veihmeyer and A. H. Hendrickson.

Unless in some sort of permanent covercrop, orchards are usually cultivated just before harvest, to aid in the harvest operation, by smoothing off the soil.

## 3. Irrigation

Methods of irrigation are discussed in Section II of this circular; the present discussion is more concerned with water use.

**The basic aim** of irrigation, whatever the method used or frequency of application, is to keep enough moisture in the soil around the major portion of the tree roots so that some is always readily avail-

able for fruit and tree use. A certain proportion of the total amount of moisture in the soil is readily available to fruit trees. As this proportion is the same for all, apricot trees can use as much as others, but no more.

**When to irrigate.** The normal processes of growth of tree and ripening of fruit are maintained when the tree is not allowed to exhaust this readily available moisture, and to remain dry for any considerable period. If the readily available moisture is exhausted, the leaves droop and the growth of the fruit is retarded. Such a wilted condition of the trees is noticeable in many apricot orchards during the summer and fall after the crop is picked. This neglect probably results from the mistaken belief that the trees' principal work is finished when the crop is picked.

The soil moisture conditions in an orchard when the readily available moisture is thought to be nearly exhausted may be approximately determined by observing the behavior of some of the common weeds, such as pigweed. These plants send their roots deep into the soil, and when they show signs of wilting the grower may be certain that the trees also will wilt in a few days. A few of these weeds in various parts of the orchard are valuable as indicators of the soil-moisture conditions. Examination of the soil with an auger to the depth containing most of the roots (usually 5 to 6 feet) is also helpful.

**Number and depth of irrigations.** Wherever irrigation water is available, apricot orchards are usually irrigated several times during the growing season. In some of the rolling foothill areas, where water is either unavailable or too costly, apricots are grown without irrigation. In the latter districts a fair crop of fruit may be produced, but the trees do not grow as large as they do in the irrigated sections, and the yields are smaller. Growing apricots on unirrigated land in certain sections of the interior valleys has not been profitable.

Because the apricot ripens its fruit comparatively early in the season, the orchards are seldom irrigated more than once or twice before the crop is picked. On some fine-textured soils, which hold a relatively large amount of readily available moisture, no irrigation may be necessary until after harvest. On sandy soils, on the other hand, it may be necessary to irrigate two times before picking. In some districts the winter rainfall may not be sufficient to wet the soil containing a majority of roots. In this case the trees in these districts enter the growing season with some of the roots in dry soil. This fact must be considered in planning the irrigation schedule for the year. Likewise, an allowance should be made for the water used by covercrops, if the latter are allowed to grow late in the spring.

A soil auger or prod is useful in ascertaining the depth of penetration of irrigation water. The average irrigation does not penetrate as deep as most growers suppose. Each irrigation should wet the soil containing a majority of the roots. This depth will vary, but in most cases it can probably be safely assumed that most of the roots are contained in the upper 5 or 6 feet of soil. If this depth is wetted at each irrigation, the number of applications necessary is less than where only relatively shallow penetration is secured each time.

## 4. Covercrops

Covercrops are annual or perennial, herbaceous crops, grown to supply green manure, or organic matter to the orchard soil. Permanent covercrops such as alfalfa or grass sod are not found in California apricot orchards. However, some sort of winter covercrop is frequently grown. This may be a planted crop, or the natural weed growth. If the latter, the weeds may be allowed to grow after the last irrigation, or the ground may be disked or harrowed, and the weeds allowed to grow after the first fall rains.

Planted covercrops are often used, es-

pecially the leguminous crops, which may supply the soil with nitrogen.

The growth of the covercrop depends upon the soil, water supply, temperature, and other environmental factors. The covercrop is usually seeded about September, and irrigation is often needed for germination. It is important to secure germination before temperatures become too low for good growth, as the object of the covercrop is to produce a large tonnage of green manure. As the fall temperatures in some areas are lower than in others, the covercrop grown should be known to do well under the temperature conditions normally prevailing in the district. Grower experience in the different districts should be used as a guide in selecting the proper covercrop in relation to temperature.

Among the common leguminous plants used for winter covercrops are sour clover (*Melilotus indica*), common vetch (*Vicia sativa*), and purple vetch (*V. atropurpurea*). Vetch planted with a nurse crop of barley may do better than vetch alone. The mustards and cereals—rye, barley and oats—are nonleguminous plants most commonly used.

Winter covercrops are not used as frequently for apricots (except perhaps for the natural winter weed cover) as for other deciduous tree fruits, because the higher humidity in orchards in covercrops favors the occurrence of blossom brown rot, to which the apricot is particularly susceptible, and to attacks by shot-hole fungus.

In areas with high temperatures at time of fruit maturity, especially if the soil is light-colored and highly reflective, there is some evidence that a covercrop at the time of harvest may reduce the damage caused by pit-burn. This is undoubtedly due to a lowering of the air temperature in the orchard, and a reduction of radiant heat from the soil surface. The same effect can be secured by keeping the soil surface moist during the few days before harvest, but the latter is often impractical because of the necessary harvest operations. Such a practice must be used with caution in districts with high summer humidities, as brown rot of the fruit may then became more serious.

For a more complete discussion of covercrops and fertilizers, see Exp. Sta. Cir. 354, *Fertilizers and Covercrops for California Deciduous Orchards*, by E. L. Proebsting.

## 5. Fertilizers

**Commercial fertilizers.** Apricots respond to nitrogen applications on most California soils, at least as the trees become older. No locations are known where apricots respond to other elements supplied by common commercial fertilizers—phosphorus and potassium. Apricot trees that are deficient in nitrogen will make poor growth and have yellowish foliage; the fruit will tend to color early and be smaller and firmer. Applications of nitrogen to trees making acceptable growth in the orchard will result in greater growth, requiring heavier pruning, and often in delayed maturity of the fruit, and occasionally in soft and unevenly ripened fruit. For these latter reasons it is desirable not to apply nitrogen to apricots unless they are showing some symptoms of need.

Trees with a high nitrogen content, or trees with light crops which respond similarly in growth, are known to be more susceptible to damage by pit-burn. Actually, the best-quality fruit, especially for shipping, is produced on soils low, but not deficient in nitrogen.

Adequate but not excessive nitrogen applications may not result in increased yield for two or three years, and in determining the need for nitrogen in questionable cases, it might be well to fertilize only a few trees and later follow the procedure indicated by the trees used in the test.

So far as the response of the tree is concerned, the several kinds of nitroge-

nous fertilizers are equally effective when applied on the basis of actual nitrogen content. Ammonium sulfate is a common fertilizer, and applications of 2 to 7 pounds per tree, based on age or need, are usual amounts. Ammonium sulfate is usually applied in the fall or early winter; calcium or sodium nitrate in the spring or late winter, as it is more readily available to the tree. However, for equivalent amounts, either form, or other forms, will supply the tree with equal amounts of nitrogen unless it is lost from the root zone by leaching. The fertilizer used, then, should be determined by cost per unit of nitrogen.

Natural nitrogenous fertilizers, such as manure, will vary considerably in nitrogen content and the nitrogen is usually much slower in becoming available to the tree. Such materials will supply nitrogen eventually in the same amount as the chemical fertilizers when applied at rates proportionate to their nitrogen content.

**Applying the fertilizer.** The soil type may determine the best method of applying the fertilizer. In light, sandy soils on which large amounts of irrigation water are used, the fertilizer may well be divided into two or more applications. This will overcome the tendency for loss by leaching in such soils.

Occasionally it may be desirable to fertilize the covercrop, if a nonleguminous or natural weed cover is used. If the orchard regularly receives nitrogenous fertilizer, the needs of the covercrop may well be met. However, if an annual application is made, it may well be made over the entire land area, rather than under the skirts of the tree. This will provide maximum benefit to the covercrop. In some local situations, the covercrop may respond markedly to applications of mineral elements other than nitrogen, and supplying this requirement may be worthwhile in securing maximum growth of the covercrop. However, as mentioned above, the trees themselves rarely respond to such fertilizers, so that their use had best be judged on the basis of the covercrop alone.

## 6. Frost protection

The equipment needed for frost protection is discussed in Section II of this circular. The following discussion is concerned with the response of the tree to low temperatures, and the methods of operating heating equipment.

Normally no damage from spring frosts occurs before the buds start to swell. When such buds are beginning to show color, they will endure a temperature of 25° F for 30 minutes or less without serious injury to the crop, while open flowers, and the young, green fruits will endure only 28 and 31° F, respectively, for the same length of time. With the minimum temperatures that may ordinarily be expected in most apricot districts during the blooming season, it is perfectly feasible to heat the orchard and save the crop.

**The equipment** used by apricot growers for orchard heating usually consists of approximately 100 open, lard-pail-type heaters per acre, several tested thermometers, an electric frost alarm, lighting torches, a storage tank, and a tank wagon or sled for distributing fuel.

The heaters are usually placed one for each tree in the center of each square formed by four trees, with a double row on the windward side of the orchard. In other cases, one heater to each two trees is used. Once filled, they are kept covered to keep out rain.

The use of many small fires, uniformly distributed in the area to be heated, gives the best results in orchard heating. Apricots normally are not grown in areas experiencing frequent and severe spring frosts, so equipment that will raise the temperature 5 to 8 degrees is usually all that is practical. Under such conditions, the length of time the heaters are burned is usually relatively short, but adequate storage facilities for extra oil should be maintained. Dangerous temperatures are

usually reached in the early morning hours, but occasionally it is necessary to light the heaters as early as midnight. Whenever the heaters are started the grower should be able to keep them burning until after sunrise, since the coldest time is usually shortly before daylight. The open, lard-pail-type heater burns for 3 to 3½ hours before it needs to be refilled.

The frost alarm is set to ring a bell when the temperature reaches 33° or 34° F. At first about half the heaters are started, probably every other row of heaters through the orchard, starting on the windward side. By watching thermometers placed in various parts of the orchard, especially those in the cold places, the grower is able to decide whether he should light all of the heaters, or whether he may extinguish some of them with safety.

While some growers heat their orchards economically and successfully, others fail. Some of the chief causes of failure are: use of untested thermometers; failure to connect the frost alarm; insufficient storage capacity to permit refilling heaters each morning after firing, through protracted cold periods; and use of insufficient numbers of heaters to maintain temperatures above the danger point. It is better to heat part of an orchard with adequate equipment than to risk spreading the equipment over a larger area than it can heat effectively. It is not necessary to raise the temperature above approximately 32° F, as the added heat yields no benefit, is costly, and may deplete fuel reserves unnecessarily.

Mechanical blowers, or wind machines, have been used in deciduous orchards and citrus groves. These machines also represent a sizable investment on the part of the grower, and their success depends largely on the conditions under which the frost occurs. Low, well marked ceilings favor their successful operation; it is probable that they will serve in many instances. However, the temperature cannot be raised as much with such machines alone as with adequate orchard heaters. The usual degree of frost and other local conditions might well determine the advisability of using such machines for frost protection; but their use in deciduous orchards has not been sufficient to make definite recommendations.

**Results of frost damage.** Frost injury to young apricots may usually be detected during the forenoon following the night when freezing temperatures occurred. The first indication of frost injury is color on the skin of the kernel in the pit. If this shows any brown color, even though the spot is no larger than a pinhead, the fruit will drop before maturity. After a few days, frost injury can also readily be detected by small, light-colored dots on the surface of the fruit. About a week after freezing, severely injured fruits are usually stunted in size and beginning to turn yellow in color. Fruit less severely injured may remain on the trees until about two weeks before picking time. In severe cases of frost injury all the tissues of the fruit may be frozen, then the fruit will darken immediately upon thawing.

## 7. Fruit thinning

Thinning is usually practiced on apricots for fresh shipment, canning, and to some extent for drying. Under favorable conditions, the apricot sets many more fruits than it can develop to satisfactory commercial size. Thinning increases the size of the fruit, assists in distributing it equally over the tree, and sometimes improves the quality of the fruit. The two important factors in thinning are the time of thinning and the distance to which fruits should be thinned (or the amount of thinning).

Early thinning is more effective than late thinning, but is more difficult to perform economically; the fruit is harder to remove from the tree, and it is more difficult to visually regulate the crop because

of the small size of the young fruits. Apricots are normally thinned when they are about the size of the thumb, which coincides with the time they are not growing appreciably (pit-hardening). This is usually in late April or early May for most districts. Actually, the ease of removal of the fruit usually determines the practical limit as to how early thinning may begin; when the fruit can be removed without tearing the bark or breaking the spurs, thinning may be done. The actual size of the fruit at this stage of development will vary with initial set and season, and as discussed below, other factors may influence the best time to thin.

The grower should realize that heavy initial sets will tend to reduce mature fruit size, and this may be partially overcome by earlier thinning. Light sets, on the other hand, can well be thinned at a later date, to take advantage of the easier thinning and such natural drop as may occur during the period of delay.

Thinned and unthinned fruit on apricot shoots. Thinning will improve size of fruit and lessen danger from brown rot.

It is advantageous to thin off the smallest fruit, leaving the largest, as there is a significant correlation between size of fruit early in the season and at maturity. Naturally, diseased, injured, misshapen, and double fruits should be removed at time of thinning. Apricots should be thinned to 1½ to 3 inches apart (see photo)—the longer distance when the set is heavy. When the crop is light, thinning may consist only of breaking up clustered fruit, as the total crop may not be larger than the tree can adequately support. Fruit borne in clusters may be somewhat off-shape. Therefore, such clusters are best broken up if the fruit is to be shipped or canned. This is not important if the fruit is to be dried because shape of fruit makes very little difference in this outlet. In any event, in areas where brown rot may attack the fruit, they should be spaced so that they do not touch.

Thinning always decreases the total yield, but is in part compensated by the increased size of the remaining fruit. For shipping, the premium for large sized fruit is sufficient to justify appreciable reduction in total yield; canning contracts are usually on a size basis, and the crop should reach the contract size or the returns may be considerably less. Size is not so important for drying, but the smaller fruits are much more expensive to cut for drying, and some regulation of size is therefore usually economically sound.

The grower must learn from experience to regulate crops to produce economical-sized fruit for the normal outlet. To do this he must integrate initial set, time of thinning, and amount of thinning. There are no hard and fast rules to follow other than the relations indicated above; but realization that heavy sets require earlier and heavier thinning to attain a desired size, and that thinning of light crops may be delayed, will help in adjusting the crop to produce good-sized fruit. The vigor of the tree will have

some influence on fruit size; vigorous trees will usually require less thinning than weak trees, but this factor is secondary to those discussed above.

In thinning apricots it is desirable to break up clusters of fruit, and it is often advantageous to thin out fruit borne on the tips of long terminal growth rather severely, because such fruit often suffers from sunburn and is usually small.

**Blossom spray thinning** is a promising development—all of the advantages of early thinning (larger fruit and more vigorous tree growth) accrue. Even if some hand thinning is necessary, following spray thinning, the cost of this expensive operation is greatly reduced.

The disadvantages of spray thinning are: Difficulty of correct application; irregular thinning obtained; danger of reduced crop from disease or frost after spray thinning.

Definite recommendations for blossom spray thinning cannot be made because each orchard and each material used for thinning presents an individual problem. Therefore the grower wishing to try spray thinning is advised to consult his local Farm Advisor.

**Fruit counts.** A helpful aid in determining the efficiency of the thinning operation is to make fruit counts after thinning. For such purposes, all fruit on typical scaffold branches constituting from one-quarter to one-third of a tree are counted. From these counts, the average number of fruits per tree left can be estimated. For example, at 70 trees per acre, each tree will need to have approximately 2700 fruits, averaging 12 per pound at maturity, to yield 8 tons per acre. The grower must have enough experience in the orchard to know in a general way the tonnage the orchard is capable of producing, and the average sizes of fruit he can expect at different levels of production, to use this device successfully for, as mentioned before, severe thinning will reduce tonnage. If these factors are known, such counts will indicate whether the thinning practice in any given season is reasonable.

## 8. Bracing and propping

As apricot trees grow older the branches become long and heavy with foliage and fruit. If well-shaped, they are able to withstand normal loads. However, under the weight of large crops, aggravated by winds, or in the case of poorly shaped trees with long horizontal branches, the load of foliage and fruit may cause large branches to break down. With well-shaped trees, propping during the time the fruit is maturing may be sufficient to reduce such breakage to negligible amounts.

The props should be strong, and long enough to brace the branches some distance from the trunk of the tree. Usually rough-sawn $1 \times 3$ or $1 \times 4$ boards are used. They are notched in the end to support the limb. The props are placed as needed to aid in taking the load off the limbs. Props 8 to 10 feet long are usually suitable.

If the trees are structurally weak, or some of the crop load can be supported by permanent bracing it may be used, but this will not do away with the necessity for props under heavy fruit loads. Apricots are frequently braced by wires running from screw eyes in the various scaffold branches to a ring in the center. Such a system has the advantage of being in the center of the tree and out of the way of most orchard operations.

The method of leading a wire around the tree so commonly used for peaches is not often used for apricots, largely because the tree habit makes it more difficult to apply to apricots and, if well pruned, there is little need for it. It is also more likely to be in the way of orchard operations, especially getting ladders into the centers of the trees.

## 9. Spraying

Apricots are subject to attacks by a number of diseases and insect pests, some

of which are difficult to control. Some of these diseases and insects are widespread and occur in nearly all of the apricot-growing sections; others are more restricted in distribution and occur chiefly in rather well-defined areas. Shot-hole fungus is more prevalent and difficult to control in the interior valleys than near the coast. Brown rot, green rot, and brown apricot scale give more trouble in the coastal regions than in the interior. Oak-root fungus, crown gall, bacterial gummosis, sour sap, and other troubles may occur wherever apricots are planted. Some of these troubles are most effectively controlled by spraying, while others must be handled by other means as described in the following sections.

In nearly all apricot districts it is necessary to apply one or more sprays regularly each year to control certain insects and diseases. The spray programs are varied for these districts to meet the local disease and insect situation. Spray programs (which are revised annually) are available in most County Agricultural Extension Service offices. Such annual revisions are necessary to meet local changes in disease and insect problems and to take advantage of new chemicals for their control.



Detailed discussions of the individual diseases and pests attacking apricots, and recommended control measures, appear in Section V of this circular.

## 10. Pollination

In the past apricots have been said to be all self-fertile, and hence no provision for cross-pollination was necessary. This is true of apricot varieties most likely to be grown in California at present, including the Royal, Blenheim, and Tilton. However, at least two of the newer varieties are known to be self-unfruitful, and hence to need provision for pollination. Riland and Perfection have been shown to be self-unfruitful, and not capable of setting a commercial crop with their own pollen. Both of these varieties produce an abundance of good pollen.

Because so few trees of these varieties are growing in California, anyone planning on growing them is referred to Exp. Sta. Cir. 62, *Pollination of Deciduous Fruit Trees by Bees*, by G. L. Philp and G. H. Van Sell, for information on planting plans and other methods of providing pollen in similar situations. This circular is currently out of print, but may be seen in many libraries throughout the state.

## 11. Topworking

A grower may occasionally wish to topwork trees of another species to apricots, or to change varieties of apricots. As apricot trees are long-lived and sturdy, topworking is practical if the stock trees are healthy and vigorous. Naturally, the species to be topworked should be compatible with the apricot to be placed on it; this will include all peaches, other apricots, and some Japanese plums. Other species should probably not be used for such purposes.

Topworking may be done in a number of ways, though the common cleft graft, or a modified saw-kerf graft are usually best, and most readily made. For further details on topworking, the reader is referred to Agr. Ext. Cir. 96, *Propagation of Fruit Plants*, by C. J. Hansen and E. R. Eggers.

Care should be taken to see that wounds heal readily and well. Branches up to 4 inches in diameter should heal completely in two or three years. On larger stumps healing may take longer, and danger of entrance of wood-rotting fungi is proportionately greater.

Bacterial gummosis is often very severe on topworked apricot trees.

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Apricot Culture
IN CALIFORNIA
CLARON O. HESSE
CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service
CIRCULAR 412

# SECTION V - Diseases and pests

**Both diseases and pests attack apricot trees. Here are some of the recommended control measures**

## 1. Parasitic diseases

**By E. E. Wilson**

**Shot-hole** is caused by the fungus *Coryneum beijerinckii* Oud. Severe infection will result in heavy defoliation of the tree and malformation of the fruit.

***What to look for.*** Shot-hole is noticeable during the winter, causing blackened, dead buds. During the spring and early summer it shows up in reddish spots on the leaves and fruit (see photo).

***What to do.*** Control of the disease is obtained by consistently spraying the trees each fall, after the leaves fall, but before the long winter rains start—usually from November 15 to early December.

IN THIS SECTION



Co-authors of this section are: E. E. Wilson, Professor of Plant Pathology and Plant Pathologist in the Experiment Station; Leslie M. Smith, Associate Professor of Entomology and Associate Entomologist in the Experiment Station; Tracy I. Storer, Professor of Zoology and Zoologist in the Experiment Station.

The spray used should be a 5–5–50 (or stronger) bordeaux mixture.

If the disease has been effectively controlled in former years, the fall spray may be sufficient. But in some years, prolonged rains at the time the leaves are appearing make it necessary to apply additional sprays. A spray at the red-bud stage (see "Brown rot") and another immediately after the jackets are shed may be required in such years.

**Brown rot** has become a serious disease in many of the apricot sections of the state. It is caused by two fungi, *Sclerotinia fructicola* (Wint.) Rehm., and *S. laxa* (Worm.) A. and R. On apricots the latter is the more important.

***What to look for.*** The first sign of the disease in spring is a withering and dying of blossoms (see photo) followed by a blighting of twigs as the fungus invades these parts through the bases of diseased blossom clusters. The affected blossoms are usually covered with ash gray, powdery masses of spores which make it easy to identify the disease.

***What to do.*** The blighted twigs harbor the fungus from one season to the next, and during early spring produce large numbers of small light gray tufts (sporodochia) from which the spores spread to the blossoms as they appear. Thus one important step in controlling the disease is to remove diseased twigs before the blossoms appear.

Effects of shot-hole on apricots.

Brown rot on ripening apricot fruit.

For prevention of blossom infection, spray during the red-bud stage of the blossoms (just as they are emerging from the winter buds) with bordeaux mixture, 5–5–50 or stronger.

In seasons when rains are frequent during the blossoming period, the trees should be sprayed again after the blossoms have entirely emerged from the winter buds, and a third time when they are approaching full bloom.

As mentioned above, the red-bud spray will also aid in preventing shot-hole damage to fruit and leaves.

***If this fails*** (in several districts growers have reported unsatisfactory control of brown rot with the standard bordeaux mixture program) a spray of monocalcium arsenite may be the answer. It has been used successfully since 1940 as a supplementary spray.

This should be applied as a mixture consisting of 3 pounds of monocalcium arsenite to 100 gallons of water, during January, when the trees are fully dormant. This chemical can not be combined with other chemicals in a spray, particularly with oils. Pruning should be completed several weeks before spraying, or delayed until afterward.

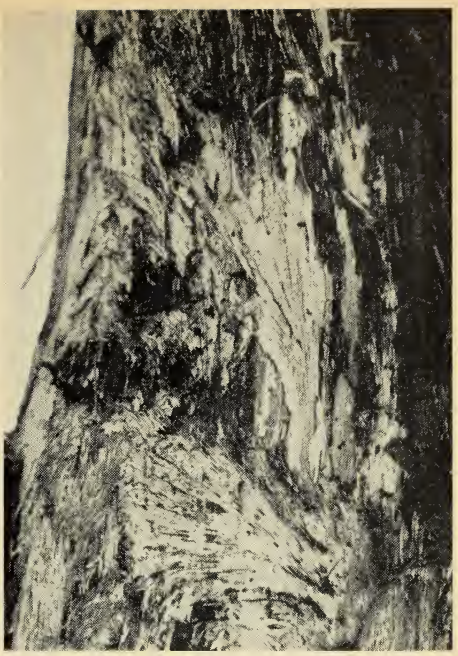
***Prevention*** of the disease on the fruit is difficult, since a spray which leaves a residue cannot be used on fruit that is beginning to ripen. Fortunately fruit rotting is not common, and effective prevention of blossom infection does much toward keeping brown rot from becoming serious.

**Jacket rot** (green rot) is sometimes mistaken for brown rot. It may be caused by either of 2 fungi, *Sclerotinia sclerotiorum* (Lib.) Mass., or *Botrytis cineria*, the common gray mold.

***What to look for.*** This disease attacks young, green fruit and first causes dark brown to black, sunken areas. These rapidly expand to the entire fruit—a characteristic not common with brown rot.

During the spring, the fungus *S. sclerotiorum* produces small, urn-shaped spore-bearing structures on the surface of the

Jacket or green rot on apricots.



Fan-shaped growth of oak root fungus.

soil under the trees. At the time the trees come into bloom the spores discharge from these structures and float through the air, coming in contact with the blossoms. They germinate and infect the jackets or calyx cups and then invade the fruit when the jackets are being shed, providing rain occurs at that time.

***Control.*** In trials, ferric dimethyl dithiocarbamate has been helpful in preventing jacket rot. This chemical is known to the trade by the generic term Ferbam, and is currently being sold under at least one trade name, Fermate.

It should be applied as a spray consisting of 1½ pounds of Ferbam to 100 gallons of water, when the trees are in full bloom.

**Armillaria root rot** (oak root fungus) is caused by the fungus *Armillaria mellea* (Vahl.) Qual., which attacks the roots and crowns of apricot trees, eventually killing them.

***What to look for.*** Affected trees will have white to light tan, fan-shaped masses of fungus growth between the bark and the wood of the crown and main roots (see photo). The trees may die at any time of the year, but probably most frequently during the first hot days of summer.

The fungus is present in many virgin soils throughout the state, where native trees have been growing—particularly the oak—and an orchard planted in such soil may begin to die in the areas formerly occupied by the native trees. The area of the diseased trees will enlarge from year to year as the fungus follows out the roots and spreads to the roots of healthy trees.

***What to do.*** The most promising treatment is to fumigate the infected soil with carbon bisulfide. First allow the soil to become dry during the summer months, then remove the trees from the infected area. Get all the roots in the top 12 inches of soil. With a metal rod, punch holes about 6 to 8 inches deep, about 18 inches apart and into each hole pour 1⅗ ounce (liquid measure) or 2 ounces by weight, of carbon bisulfide. Plug the

holes immediately with soil, then wet the top of the entire area with water, to a depth of about 4 inches.

Hand- or power-operated equipment for application may be bought or rented.

Do not place this chemical in the soil any nearer than 6 feet from the base of any healthy trees.

Marianna 2624 rootstock has been shown to be fairly resistant to the *Armillaria* fungus and can probably be replanted in soil that has been treated. However, evidence is not conclusive that this rootstock will remain free of the disease indefinitely.

Previously infected areas may also be replanted with California black walnut, figs, or pear on French root—these species are resistant to the disease.

**Black heart** is the name of a disease affecting apricot trees, caused by the fungus *Verticillium albo-atrum* R. & B., a soil-borne parasite causing what is known as verticillium wilt in such crops as tomatoes.

***What to look for.*** The first sign of this disease is a wilting of the foliage during the first hot days of summer (see photo). This may occur over the entire tree, or only on certain branches. In some instances the foliage will drop, but in severe cases it remains on the trees. In mild cases the trees will frequently produce new foliage and apparently recover.

To make certain that the disease *is* black heart, make cuts into the wood of the affected branches, cutting into the sapwood about an inch below the surface. If the disease is due to *V. alboatrum*, blackened streaks occur in the wood—hence the name black heart.

***No control*** of this disease is known, once it has gotten into the trees. Avoid the use of intercrops such as tomatoes, cotton, potatoes, strawberries, or Persian melons, which are notably susceptible to the verticillium fungus, although the last four mentioned seem to develop strains of verticillium which are not so likely to cause black heart.

Land previously planted to tomatoes should not be used for growing apricots.

**Crown gall,** caused by the bacterial organism *Agrobacterium tumefaciens* (T.) Bergey *et al.*, can cause serious damage to apricot trees by girdling the roots and crowns.

***What to look for.*** Crown galls are woody, irregular-shaped enlargements of various sizes on the roots and crowns of trees, and may be seen when the soil is removed (see photo).

Crown gall on the roots of four-stone fruits. The apricot root is fourth from the left.

***What to do.*** The crown gall bacteria seem to be widely distributed in California soils and may persist in the soil for at least 5 or 6 years. They enter the tree through wounds, so careful cultivation should be practiced to avoid hitting the trees' crown with tillage equipment.

Surgical or medicinal treatment of existing galls while the tree is young and before the crown and main roots are extensively damaged will greatly lengthen the life of affected trees.

Remove the soil from around the galls. Chisel or knock off any part of the gall that is easy to remove. Paint the remaining part of the gall, and the wound, and about an inch of healthy bark around the gall with a mixture of one part Elgetol 20 and 4 parts of methyl alcohol (methanol). *Do not use denatured alcohol as a substitute for methanol.*

Where none of the gall may be removed by cutting or knocking, use the mixture to paint the entire gall and an inch of the surrounding healthy wood.

When the crown gall involves most of the circumference of the trunk, only part of the gall should be treated at one time—the remainder can be treated after an interval of a month or two.

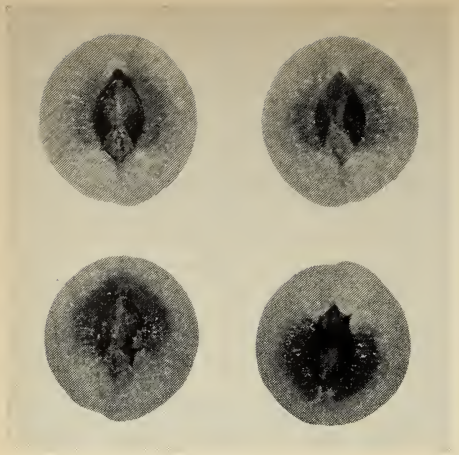
In cases where extensive cutting into the gall has been done and healthy portions of a tree have been cut with contaminated tools, it is advisable to paint such wounds with the Elgetol-methanol mixture diluted to one part of the mixture and 9 parts water. This diluted mixture can also be used to disinfect tools.

The treatment described should not be performed during the hottest part of the summer. After treatment the affected parts should be covered with soil to prevent sunburn.

**Bacterial gummosis** (bacterial canker) is caused by the bacterium *Pseudomonas syringae* (Van H.) Bergey *et al.* The apricot tree is highly susceptible to this disease.

***What to look for.*** This disease is characterized by cankers of elongated, dead areas on the bark of large limbs and trunks. The cankers exude large amounts of gum (see photo). In some instances little or no gum is present and the bark becomes brown, moist, and sour-smelling. (This type of symptom is frequently called sour sap, but should not be confused with the sour sap that develops in roots of trees exposed to excessive soil moisture).

Bacterial gummosis on apricot buds. Shriveled flowers and unopened buds have been killed.



Symptoms of pit-burn. Note dark, water-soaked appearance of inner flesh.

Twig at left shows little-leaf damage. Twig at right from tree treated with zinc.

***No control*** is known for cankers already in the trees. However, there is a fair amount of evidence that spraying trees in the fall, with a 6–6–50 or 8–8–50 bordeaux mixture will reduce to some extent the development of new cankers.

## 2. Nonparasitic diseases

**By Claron O. Hesse**

**Fog spot.** Near the coast a spotting of the fruit (similar to that produced by shot-hole fungus) sometimes occurs. It evidently results from climatic conditions and does not seem to be caused by a specific organism; none of the commonly grown varieties is known to be resistant to this trouble.

**Sunburn.** Exposed fruit, particularly that on the ends of branches, is sunburned if daytime temperatures remain high for a period of several days or more, especially if these high temperatures occur immediately after a rain or fog. The affected fruits show cracks in the skin. The affected part of the fruit shrivels, and dries. Common fruit rots may enter the injured tissue.

***Sunburn may be avoided*** somewhat by keeping the trees vigorous, affording good foliage cover; and, in the case of tip fruit, by heavy thinning.

**Pit-burn.** Apricots in the interior valleys are subject to a trouble which is brought on when a period of exceptionally hot weather occurs between the time the fruit begins to lose its grass-green color and the time it is ripe enough for shipping or canning. Pit-burn appears after a few days of temperatures in the high 90's or above. Exceptionally vigorous, high nitrogen-status trees may develop pit-burned fruit at the lower temperatures; otherwise the condition seldom becomes serious unless the temperatures exceed 102 or 103° F for two or three days.

***Symptoms.*** The first evidence is a softening of the flesh around the pit—as if the pit had been heated and had thus caused the flesh in the interior to ripen faster than on the exterior, while the outside part of the fruit remains firm. The soft area turns brown in a few days, but no evidence of the trouble is visible at the surface. When cut, fruit in the late stages of this trouble often shows the presence of one or more of the rots which will attack ripe fruit. Evidence of this condition can be most readily seen by cutting the fruit at right angles to the suture. Severely affected fruit cannot be used for shipping or canning, but may be sold for drying if actual decay has not

started. As discussed under covercrops, observation indicates some relief may be secured by growing a light, summer weed cover, or by keeping the soil surface moist during the time the fruit is maturing.

**Boron injury.** Excess amounts of boron either occurring naturally in the soil or introduced in irrigation water have caused injury in some apricot districts.

***Symptoms*** usually appear in April in the form of dark brown areas on the stems of the current season's growth, and to a lesser extent on the petioles and on the large veins on the lower surface of the leaves. These injured areas soon become cracked and corky and the tips of the stems commonly die (see photo). If other conditions are favorable for growth, the lateral buds on the injured shoots will start to grow, only to be killed back later. Gum is often exuded from the injured areas. By June or July the stems have begun to enlarge at the nodes and by the time the trees are dormant these enlargements have often reached the size shown. Mild symptoms may occur without appreciable reduction in yields, but in severe cases the trees will be killed.

***What to do.*** If excess boron occurs naturally in the soil, or has accumulated through the use of irrigation water too high in boron content, the only possible means of correcting the condition is by leaching the soil with large amounts of boron-free water, if available. The most desirable method of control is the adequate use of water low in boron.

**Little-leaf** is caused by a deficiency of zinc in the soil.

***Symptoms.*** The trouble known as little-leaf is chiefly shown by the appearance of the leaves soon after growth starts in the spring. The leaves at the ends of the branches appear as rosettes of small, narrow, stiff leaves, mottled with yellow (see photo). The yellow mottling is often found on other leaves as well. In cases where the trouble is comparatively mild there may be no mottling and the trees may live as long as normal ones, but in severe cases the twigs die back and the whole tree may succumb in two or three years. The disease also causes dropping of young fruits, reduction in size of those remaining on the tree, and in delayed maturity.

***Control.*** The disease may be treated by driving zinc-coated nails or pieces of zinc into the trunks or branches, or by spraying the trees with zinc sulfate or zinc oxide. The nails or zinc pieces are driven into the sapwood far enough so they will not fall out later in the season. They should be spaced about one inch apart, because when they are driven too close together serious injury to the bark may result.

Spraying in the dormant season with 50 pounds of zinc sulfate to 100 gallons of water the first year, and with 25 pounds of this material to 100 gallons every year thereafter, seems to be the most promising method of control.

Massive soil applications of zinc sul-

Typical symptoms of boron injury. Note cracking of bark. Dead tips and enlarged nodes are also symptoms.

Fruiting wood of Royal apricot shedding unopened buds.

fate, at the rate of 15 to 20 pounds per tree, applied in a trench about four feet from the trunk and 12 to 14 inches deep, may prove effective in stubborn cases. This method is especially valuable in small areas where the trees do not respond to other treatments.

A foliage spray of zinc oxide, 5 pounds per 100 gallons, is sometimes effective in curing this deficiency, especially if applied early in the spring.

**Shedding fruit buds.** Apricot trees shed many of their fruit buds in some years.

***Symptoms.*** The first signs of this trouble occur shortly before the normal blossoming season when examination shows that a considerable proportion of buds show no evidence of swelling. A few days later the affected buds drop (see photo), leaving some unaffected ones that open irregularly. The blossoms open over a long period instead of a few days, with the result that often one may find young fruit of two or three distinct sizes, as well as some late blossoms on the tree at the same time. This trouble is caused by the lack of a sufficient amount of cold weather to break the rest of the flower buds. It is associated with relatively high minimum temperatures during November, December, and January. The Tilton variety seems to be more seriously affected by this trouble than either the Royal or Blenheim.

***Control.*** Usually no effort is made to correct this difficulty in the main commercial apricot areas. It is sporadic in occurrence, and under Central Valley and coastal valley climatic situations is difficult to anticipate. In some areas of southern California, notably Ventura County, dinitro (DN1 or Elgetol) sprays are recommended to bring the trees into bloom more normally after mild winters.

For this purpose the trees are sprayed early in February, or about a month before bloom is wanted, with a spray containing 1 pint of the dinitro material per 100 gallons of water. This spray is caustic, and will harm the trees unless applied when they are fully dormant; it must not be applied too early or it will not be effective.

The use of a chemical spray for this purpose is not recommended except in such locations as mentioned, where some effect from mild winters is usual, and where severe bud drop may occur in most years. In the main production areas the use of such sprays might well bring on earlier bloom and result in a greatly increased frost hazard.

## 3. Insect pests

**By Leslie M. Smith**

Two types of insect pests attack apricot trees: Chewing insects which bite off and swallow solid pieces of the plant; sucking insects which suck the juices but do not swallow solid particles.

Chewing insects are controlled by spraying with stomach poisons (such as the arsenical compounds); sucking insects because of their method of feeding are controlled by materials which come in contact with their bodies (such as oil sprays).

A few pests attacking apricot trees are not controlled by either stomach poison or contact insecticides—they require special treatment.

### Sucking insect pests

**Unarmored scale** insects are more often found on apricots, with the brown apricot scale, *Lecanium corni* Bouche, predominating. The black scale, *Saissetia olea* (Bern.), is less frequently found except in the coastal regions where it occurs with the brown scale.

***What to look for.*** Scale are small, disklike insects found on the bark and twigs in great number. As indicated, they may be either black or brown. They pass the winter as immature scales attached to the new growth.

***Control*** of either brown or black scale may be obtained by spraying in mid-winter, any time after the first heavy rains, but before the buds swell in the spring, with dormant petroleum oil. Both species of scale overwinter as immature scales.

The spray used should be a 3 per cent emulsive, or 4 per cent commercial, paste-type emulsion. Thorough application and special attention to terminals of branches are essential for satisfactory results.

**Armored scale insects.** Three species of armored scale are occasionally found on apricots. These are the San Jose scale, *Quadraspidiotus perniciosus* (Comst.), the Italian pear scale, *Epidiaspis leperii* (Sign.), and the olive scale, *Parlatoria oleae* (Colvee).

***Look for*** minute, gray, disk-shaped insects on the bark of twigs and limbs. They may occur in great numbers.

Armored scale may kill the cambium (inner layer of bark) of larger limbs on one side, which will produce a flattened or sunken area on the limb in a few years. When San Jose scale or olive scale settle on the fruit, they produce a small, red-ringed mark at the feeding site.

***Control*** of armored scale may be obtained by spraying in mid-winter with a 4 per cent emulsive, or 5 per cent commercial flowable oil emulsion.

**Aphids** rarely attack apricot trees, but occasionally the water lily aphid, *Rhopalosiphum nymphaeae* (Linn.) and the mealy plum aphid, *Hyalopterus pruni* (Geoff.) occur in the spring. These aphids overwinter in the egg stage on the trees, but rarely do any damage. If they do not become abundant until early June, no control is necessary, as they will soon leave the trees in the course of their annual migration to other plants.

***What to look for.*** Because of their small size these aphids may not be noticed in the early spring, when their colonies are small. However, their excrement, which is a solution of sugars, produces a wet and shiny appearance on the upperside of leaves directly below an aphid colony.

When these shiny spots are found on the tree the colony can be easily located above the spot by looking closely at the underside of the leaves.

The mealy plum aphids are pale green and covered with sparse, white wax, whereas the water lily aphid is chocolate-brown to black and devoid of wax.

***Control.*** If aphids reach injurious numbers in May of any given year, they should be dusted with a nicotine dust (4 per cent nicotine).

**Red spider mite.** The Pacific mite, or red spider, *Tetranychus pacificus* (McG.) occasionally damages apricots in the interior valleys.

***Look for*** tiny mites on the underside of the leaves. A hand lens may be needed to see individual mites. They are yellow or amber, with black spots. Infestation may result in yellowing and dropping of leaves.

***Control*** of this pest is seldom warranted.

**Thrips.** In some areas the flower thrips, *Frankliniella occidentalis* (Perg.) move from alfalfa fields or grasslands into apricot orchards where they cause damage to the flowers.

***How to identify.*** Shake flowers and small fruit clusters into one hand and look for yellow insects about 1/16 of an inch long. If 10 or 15 thrips can be shaken out of a flower cluster, control is advisable.

***Control*** of thrips may be obtained by spraying with 1½ pounds of wettable, 50 per cent DDT per 100 gallons of water. Avoid spraying in full bloom because of the danger of killing honey bees.

### Chewing insect pests

**Cankerworms.** Both the fall cankerworm, *Alsophila pometaria* (Harris), and the spring cankerworm, *Paleacrita vernata* (Peck), attack apricot trees. Both are wingless in the adult stage; both crawl up the trunks of trees to lay their eggs. The fall and spring (respectively) are the times when egg laying takes place by the two species.

***Look for*** slender, green or dark worms which chew on the edges of the leaves. These worms are known to many as Measuring Worms.

***Control*** of cankerworms may be accomplished in several ways. They may be stopped by placing a band of sticky material (Tanglefoot, Deadline, etc.) or an inverted funnel of window screen around the trunks of the trees. This will prevent the wingless moths from climbing the trees to lay their eggs.

Another method of control is to use a spray of 3 pounds of basic lead arsenate to 100 gallons of water and apply it in the spring. The lead arsenate may be added to the red-bud-stage spray of bordeaux, if the latter spray is used to control brown rot. In any event, the lead arsenate spray can not be used later than the jacket stage of the fruit because of the danger of poisonous residue on the fruit.

**Caterpillars.** The red-humped caterpillars, *Schizura concinna* (A. & S.) usually travel in large groups.

***Look for*** groups of brightly colored, red, yellow, and black worms.

***Control.*** Light infestations may be pruned out, and the prunings burned. If the infestation is heavy, the insects may be controlled by the use of the same spray program recommended for cankerworms (see above).

**Peach twig borers,** *Anarsia lineatella* Zell, sometimes attack and kill the tender tips of twigs, and later in the season they may also attack the fruit of apricot trees.

***Look for*** chocolate brown worms, ¼ to ½ inch in length, in the fruit at picking time, or crawling on the drying trays. If considerable of the fruit is wormy, plan on spraying the next year.

***Control.*** Spray with 1½ pounds of 50 per cent DDT wettable powder per 100 gallons of water, or with basic lead arsenate at the rate of 3 pounds per 100 gallons of water. Apply either of these sprays at petal fall, or at the jacket stage, BUT NOT LATER!

**Pacific peach tree borer.** The larvae of this insect, *Conopia opalescens* (Hy. Edw.), bore into the trunks of apricot trees below the surface of the soil. They sometimes cause serious injury and may completely girdle the trees.

***Look for*** whitish insects, about 1½ inches long, at or below the surface of the soil.

***Control*** may be obtained by fumigating the soil with paradichlorobenzene (PDB).

This material should be applied in the summer or fall, when the soil is fairly dry and the soil temperature is above 75° F. Level the soil around the base of the infected tree. Sprinkle an ounce of PDB around the tree in a continuous circle, 2 inches wide, with the inner margin of the circle from 2 to 4 inches from the trunk. Cover the PDB with about 2 to 4 inches of soil and pack it down with several flat strokes of the shovel.

Do not place PDB in contact with the bark. Do not make more than one application per year, or serious injury may result to the tree.

**Fruit tree leaf rollers,** *Tortrix argyrospila* (Walk.) are small, green caterpillars that sometimes attack apricot trees.

***Look for*** small green worms with brown or black heads. The caterpillars are about ¾ of an inch long. They roll the leaves together and live in the rolls. In their moth stage, they lay their eggs in gray, disk-shaped masses on 2- and 3-year-old branches.

***Control.*** The spray program recommended for armored scale will also control fruit tree leaf rollers.

**The cucumber beetle,** *Diabrotica 11-punctata* Mann. is a pest that does severe damage to apricots by chewing holes in the ripening fruit, and spreading the brown rot organism.

***Look for*** small, green beetles with black spots on their wings. They are about ¼ inch long.

***Control*** may be obtained by dusting with 0.1 per cent pyrethrin and 0.1 per cent Lethane in talc, at the rate of 50 pounds per acre. The dust should be applied at a temperature of less than 65° F. The dust should be applied into the prevailing wind, so that the drift will blow back over the area previously dusted. This is necessary to get sufficient coverage—small amounts of dust will knock the beetles from the trees, but will not kill them.

**Branch and twig borers,** *Polycaon confertus* Lec. will sometimes bore clean, round holes at the bases of buds and in the forks of small twigs.

***Look for*** elongated, brown beetles, about ½ inch long, and the characteristic holes in the twigs described above.

***Control*** consists of burning orchard prunings, and any dead tree stumps in the vicinity of the orchard. The beetles breed in sick, old wood, and destroying this source will control the pests themselves.

**The shot-hole borer,** *Scolytus rugulosus* Ratz. bores into the cambium layer and sapwood of apricot trees. The adults feed on year-old growth at the base of the buds and produce conspicuous gumming.

***Look for*** small, brown beetles, 3/32 inch long. The white larvae are C-shaped, and are often numerous under the bark of heavily infested trees. Gummy buds in the fall are a good indication of adult feeding punctures.

***Control.*** While the adults may feed on healthy, vigorous trees, they can lay eggs only in devitalized trees, particularly trees suffering from drought. Therefore, control consists of removing and burning infested limbs and trees during the winter, and in maintaining as much vigor as possible in the orchard.

Infested wood held for fuel should be dipped for a moment in stove oil which will kill the larvae under the bark. Beetles cannot breed in wood which has been cut for more than a year.

**Codling moth,** *Carpocapsa pomonella* (Linn.), may be a serious pest on apricots—the larvae penetrate the fruit, eating the flesh, and in some localities 30 to 50 per cent of the fruit has been damaged.

***What to look for.*** The newly hatched larvae are small and whitish, with large black heads. Mature larvae are about ⅜ inch long, white or yellowish, with head, shield, and anal plate brown.

***Control.*** Apply a spray at the jacket stage, and again in mid-May.

For the jacket spray, use 1½ pounds of 50 per cent DDT to 100 gallons of water, or 2 pounds of 50 per cent DDD per 100 gallons, or 3 pounds of 50 per cent methoxychlor per 100 gallons. (Check first with the canner to whom the crop is to be sold, to make sure he will accept the fruit.)

For the mid-May spray use 3 pounds of 50 per cent methoxychlor to 100 gallons of water (if this is acceptable to the canner), or use 3 pounds of 25 per cent parathion per 100 gallons of water.

It is well to consult the local Farm Advisor about the correct time to apply this May

spray, and if parathion is used, it is necessary to comply with all health precautions and obtain a permit from the County Agricultural Commissioner.

## 4. Rodents and other animal pests

**By Tracy I. Storer**

**Pocket gophers** may move into an apricot orchard causing damage to roots of the trees. They are reported to attack apricot roots more readily than some others, and may gnaw them off or completely girdle the bark at or below ground level.

***What to look for.*** A very complete description of the damage done by gophers, their habits, and control, is given in Ext. Cir. 138, *Control of Field Rodents in California*, by Tracy I. Storer.

The openings to gopher runs and their laterals may be evident by inspection, or by the sudden disappearance of irrigation water into the ground.

***Control*** may consist of one or more of the following: traps are useful and effective at all seasons; when gophers are flooded out by irrigation, they may be killed with an irrigation shovel, or with the aid of a dog; placing poisoned bait in burrows is useful in the spring of the year, or in the fall. Gassing is less effective, and there is a possibility of damaging trees, especially if carbon disulfide is used.

The gopher's natural enemies, such as the gopher snake and the barn owl, should be protected.

Persistent use of two or more of these methods will eliminate gophers on entire areas.

**Ground squirrels** are controlled chiefly by poison, gas, traps, and shooting (see Ext. Cir. 138). They are easy to recognize on the ground or in the trees.

***Control.*** If the squirrels are climbing trees to gather fruit, wide, metal collars around the trunks of the trees will stop them.

Grain poisoned with alkaloid strychnine or zinc phosphide reduces the number of ground squirrels during the late spring, early summer and fall.

Gassing is best practiced when the soil is damp, and traps may be useful for individual squirrels.

**Rabbits** in abundance may damage orchards, especially young trees, by gnawing the bark and eating young shoots. Shooting, use of repellant paints and sprays, and exclusion fences are the principal means of protection.

**Deer** will at times invade an orchard and graze on the young shoots.

***Control*** may be had to some extent by the use of repellants. Tie small bags containing about 2 ounces of naphthalene flakes to the outer branches of the trees. This may serve to repel deer from a few trees.

Other repellants applied as sprays are being used with success. The latest information may be obtained from the local Farm Advisor.

**Small birds** may occasionally attack apricots in great numbers, feeding on the fruit. Before instigating any sort of poison bait program against birds, it is necessary to contact the office of the County Agricultural Commissioner and receive approval of the procedure.



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Apricot Culture
IN CALIFORNIA
CLARON O. HESSE
CALIFORNIA AGRICULTURAL Experiment Station Extension Service
CIRCULAR 412

# SECTION VI - Harvesting and handling

**The sales outlet determines the time of harvest and some of the methods commonly used in handling**

The harvesting and handling of apricots will vary somewhat with the intended outlet. Usually the grower knows before harvesttime the most probable outlet for his fruit. Certainly, if he intends to ship, such practices as thinning must be modified to give the most profitable sizes in relation to total tonnage. Production for the drying-yard or cannery, on the other hand, will usually call for less thinning and later harvest.

## 1. The fresh market

Approximately 10 to 15 per cent of the total production of California apricots enters the market as fresh fruit. Almost half of this is shipped to eastern markets.

**For eastern markets.** Fruit destined for eastern shipment is harvested while still hard and firm, but showing some yellow color; the flesh should be white or turning yellow, and should come free from the stone in the freestone varieties. The exact stages will vary somewhat during the season, the earliest-harvested fruit being somewhat more mature by these standards. The best harvest maturity can most readily be learned from growers and shipping companies.

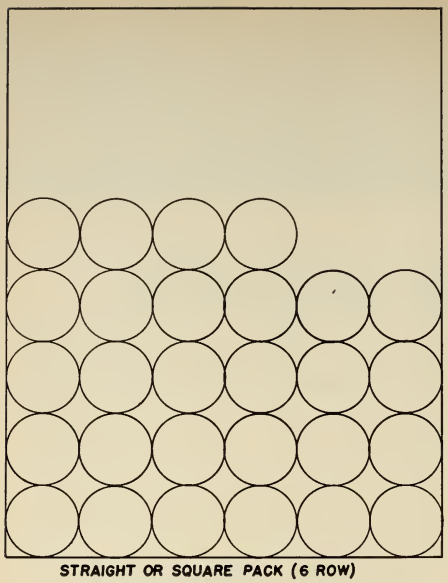
IN THIS SECTION



***The picking season.*** Experience has shown that the picking season for a given variety usually lasts about two to three weeks, and the fruit is harvested in two or three pickings. By a selection of varieties ripening at slightly different times, or because of differences due to local environment within the orchard, the fruit may be picked continually over the entire period. The peak will usually be reached some 5 to 6 days after the first picking, and a fairly constant amount can be harvested for the next 10 days before the quantity that ripens daily decreases materially. Individual trees are usually harvested at intervals of three to five days. Experience will soon teach the grower the number of pickers required, under the varying seasonal conditions, to harvest his fruit at the best rate.

***The pack.*** Apricots harvested for eastern shipment are packed in containers either at the ranch, or more likely, at a central packing plant. Ranch packing has decreased rapidly during the past two decades, and most fruit is now taken to a central plant for packing.

Apricots for eastern shipment are practically all packed in lugs (see photo). The various lugs are either packed loose or "face and fill," usually the latter. In




Placement of top layer of fruit in the "face and fill" pack generally used.
The proportions shown are for the Brentwood lug.

# Packs for eastern shipments are made to look attractive to buyers.

Photo of the top layer of the pack generally used for eastern shipment.
Box shown is the Brentwood lug.

the former case the fruit is placed in the lug without regard to its position; in the face and fill packs, the lug is made with the top in place and the bottom open. The first layer of fruit is then packed in regular arrangement, using one of the methods illustrated in the drawing on page 2. The second layer also may be at least partially arranged in the same manner. The rest of the lug is filled by placing fruit on the faced layer or layers. After weighing, the bottom is then nailed onto the box.

According to the size of the fruit, the faced layer will contain a definite number of rows of fruit across its width, and this number is stamped on the outside of the lug, indicating the size—as 7 row, 6½ row, etc. In the case of fractional counts, the pack arrangement is offset.

Table 4 shows the relation of fruit size to the various size grades for the Brentwood lug, and equivalent grades for cannery or drying. The price received for the fresh fruit depends to a great extent on the size, the larger sizes bringing higher prices. The grower can regulate size to some extent by various cultural methods. The table will indicate what he may expect from fruit developing in his orchard in any given year. Small fruit is less profitable and costs more to pack.

***Regulations.*** The California Fruit, Nut, and Vegetable Standardization Act specifies the sizes and types of packages that may be used for shipping to the various markets, and provides for the manner in which the packages shall be packed and marked. The standardization of packs includes regulations concerning the allowable limits of various types of defects, size of fruit in any given package, counts for the various containers, weights for the various containers, and other regulatory matters. These must be strictly observed, and the grower should be thoroughly acquainted with the provisions of this act if he is planning to pack his own fruit.

**For California markets.** For local or intrastate markets, the fruit will usually be harvested at a slightly more mature stage, and the containers used for shipment may be different from those used

**Table 4. Relation of Shipping Sizes to Comparable Cannery and Dried Fruit Grades**

| Relation of standard lug row count to approximate suture diameter of fruit | | Fresh fruit | Percentage distribution of dried fruit grades expected from fruit of average size shown in columns (1), (2), and (3) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Brentwood lug row count | Approximate maximum suture diam. (inches) | Fruits per pound | Standard | Choice | Extra Choice | Fancy | Extra Fancy | Extra Fancy Moorpark |
| (1) | (2) | (3) | | | | | | |
| 6 | 2-1/16 | 7 | .... | 4.4 | 16.3 | 32.6 | 43.0 | 3.7 |
| 6½ | 1-15/16 | 9 | | | | | | |
| | | 10 | 2.2 | 22.6 | 40.4 | 28.0 | 6.8 | .... |
| 7 | 1-13/16 | 11 | | | | | | |
| | | 12 | 4.9 | 43.0 | 41.6 | 10.5 | .... | .... |
| 7½ | 1-11/16 | 13 | | | | | | |
| | | 14 | 23.0 | 43.4 | 29.8 | 3.8 | .... | .... |
| 8 | 1-9/16 | 16 | | | | | | |
| 8½ | 1-1/2 | 20 | | | | | | |
| 9 | 1-7/16 | .. | | | | | | |

for eastern shipment. Otherwise the operation is the same. In these containers, they are generally packed loose and may be without lids.

## 2. The canning market

This is one of the main outlets for the California apricot crop.

Harvest for the cannery is later than for fresh shipment. The fruit is allowed to become firm-ripe on the tree; full color has developed, but the fruit has not yet begun to turn soft.

Fruit picked for canning is usually emptied into field boxes supplied by the cannery and obviously defective fruits are often removed as the picking buckets are dumped.

The boxes are placed at the disposal of the grower sometime before the harvest begins, and the necessary supply of boxes is maintained by the cannery. Cannery fieldmen often advise the grower as to the best time for picking, as preferred maturity may vary somewhat between canneries.

**Grades and sizes.** Fruit sold to the cannery is usually sold on a size basis, usual size grades being 12, 14 or 16 per pound. Ninety-five per cent of the fruit must meet this size grade to be classed as any given size. Therefore, the average size of the fruit will be considerably larger than the size grade into which it will fall, as the normal distribution of sizes will result in a considerable proportion being distinctly smaller than the average-sized fruit.

Other grade standards for canning apricots will vary somewhat from year to year, and are usually stated in the contracts offered the grower. Allowances for defective fruit will be governed somewhat by the tonnage available, the cannery demand, and perhaps the price offered. In general, the grade of fruit must be about the same as for eastern shipment, but the actual standards will vary somewhat from one year to another.

Within limits, the size of the fruit largely determines the relative price to the grower. A common contract is based on 14 fruits per pound, and tonnage should not be sacrificed to gain extra size.

It is seldom practical for the grower to mechanically grade apricots to meet a higher size grade, because the fruit does not stand excessive handling at the stage it is harvested for the cannery. However, in the case of occasional occurrences of defective fruit in certain orchard locations (due to disease or insect damage) it may be worthwhile to grade such fruits for defects to keep within the tolerances allowed by the cannery grades.

**Baby foods.** A related outlet now available for small quantities of fruit is that for baby food. The fruit is puréed, and is therefore often picked at a more mature stage, and some sorts of defects are allowed in excess of the grade standards for regular, whole or halved, canned fruit.

**Fruit for jam.** In contrast, fruit for jam may often involve largely cull fruit with no serious defect (i.e., off-shape, poor size, etc.), or fruit with too much pit-burn for canning.

## 3. The dried fruit market

While drying of apricots has decreased during and since World War II and is not expected to assume its former importance as an outlet for apricots, it still remains one of the largest single markets for this fruit.

**Harvesting.** For purposes of drying the fruit is allowed to reach full maturity on the tree, being picked only when it has reached the stage where further ripening would result in fruit too soft to handle well. The reason for this is twofold: The sugar content of the fruit increases as long as the fruit is left on the tree and thereby gives a better drying ratio; and immature fruit dries to shriveled, poorly colored halves and this materially reduces the grade of the product.

The fruit picked from the tree is emptied into field lugs. It is then taken to the cutting shed at the drying-yard.

Drying apricots involves several separate operations, starting with the delivery of the fruit to the cutting shed.

**The cutting operation** consists of running a sharp knife completely around the fruit in the suture line, separating the two halves, removing the pit, and placing the two halves of the fruit, cavity upward, on the drying tray. After several trays are stacked, they are moved to the sulfur-house on transfer trucks. Practical mechanical fruit cutters are being developed, but are not yet commonly used or available. Such machines are of great promise to the dried apricot industry.

**Sulfuring** consists of burning a good grade of sulfur, which releases sulfur dioxide fumes. These fumes penetrate the fruit, and have three beneficial effects: they increase permeability of the flesh, resulting in faster drying; they bleach the fruit, removing practically all inequalities in color, including browned areas resulting from bruises and some types of defects; they act as a preservative and insect repellant while the fruit is in the drying-yard and storage bins.

***The time of sulfuring*** required for apricots will depend in some measure on the size of the fruit, and otherwise largely on the design of the sulfur-house. In a well-designed house, sulfuring times of 2 to 4 hours seem adequate; usually the longer time.

Penetration of the sulfur can be checked from time to time until experience indicates the proper sulfuring time for the fruit-sulfur-house combination. The penetration of the sulfur dioxide fumes is marked by an indistinct line, readily observed by cutting the flesh. The fumes should penetrate about one-third the thickness of the flesh from the inner surface before the fruit is removed from the sulfur houses.

Photo of a six-car sulfur house. This type is suitable for a small apricot orchard.

After sulfuring, the trays are placed on the ground in the drying-yard for a day or two. Drying is completed in the stacks (as shown in the background).

**Sun-drying.** After sulfuring, the fruit is immediately removed to the drying-yard where the fruit on trays is exposed to the sun. The period the fruit remains exposed will vary with the temperature and humidity. In extremely hot, dry locations the time will be relatively short; in milder locations longer. The relative periods will vary from 1 to 2 days in the hottest locations to 2 to 7 days in the coastal areas. At the end of this period the trays are stacked in a staggered style with the open ends toward the prevailing wind. After several days in the stack, the fruits are ready to be placed in storage bins for sweating. For a fuller discussion of sun-drying, see Exp. Sta. Cir. 382, *Sulfur-House Operation*, by H. J. Phaff and E. M. Mrak.

**Dehydration.** Apricots may be dehydrated instead of sun-dried. Dehydration involves special equipment and has certain advantages over sun-drying which usually result in a higher-grade product. For details of dehydration principles and equipment, see Exp. Sta. Bul. 698, *Fruit Dehydration, Principles and Equipment*, by R. L. Perry, E. M. Mrak, H. J. Phaff, G. L. Marsh and C. D. Fisher.

**Storing dried fruit.** During removal from the trays, slabs and cull pieces are picked out and disposed of. When sufficiently dry the fruit should be firm, pliable, and the skin should not separate from the flesh when rubbed; they should not be dry enough to rattle on the trays. Individual pieces should practically resume their original shape when the pressure is released after squeezing a handful together.

The 3 ft. × 6 ft. trays often used in drying apricots hold about 48 pounds of cut fruit, thus about 40 trays are needed for each ton of fruit. Each tray may be used three or four times per season, depending on the length of the harvest period and the drying schedule. The average drying-yard space necessary is one acre of dry-yard for each 20 acres of mature orchard.

After removal from the trays, the dried fruit is placed in storage bins for sweating, which is essentially a process of moisture equalization. When the season is completed, the fruit is usually taken to a central dried fruit handling station, where it is processed and packaged for sale.

The dried fruit packers receive fruit with a moisture content up to 18 per cent

and it is to the advantage of the grower to approach this moisture content as nearly as is practical. By so doing he will handle the fruit with as little equipment as possible and in a shorter time.

**Cleanliness and regulations.** The grower should take every precaution to keep the fruit clean during the drying process. The Federal Food and Drug Act has certain stipulations applying to the interstate shipment of dried fruit, with special reference to the presence of dirty, decayed or insect-infested fruit in the shipment. Washing the trays at intervals whenever necessary during the drying season, and storing dried fruit in clean, dry bins are helpful measures in producing a quality product.



As may readily be appreciated from the above discussion on harvesting apricots, a grower may dispose of portions of his fruit to all three outlets in any given year. However, most apricot growers limit their market to one main outlet, and perhaps a secondary outlet for a minor portion of their fruit, as the last harvest or clean-up picking, in any one year. The economic outlook for the various outlet markets may well determine the preferred method of handling.

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# CONTENTS


# and this is what it looks like . . .

THE PHOTO above is taken from a circular on irrigated pastures in California. It shows a good lay-out of fences and gates for rotation grazing.

The drawing below is from a circular on selective weed killers and shows one reason why some weed killers are selective.

These pictures are typical of the practical, down-to-earth approach to farm problems used in many of the free publications put out by the University of California College of Agriculture.

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